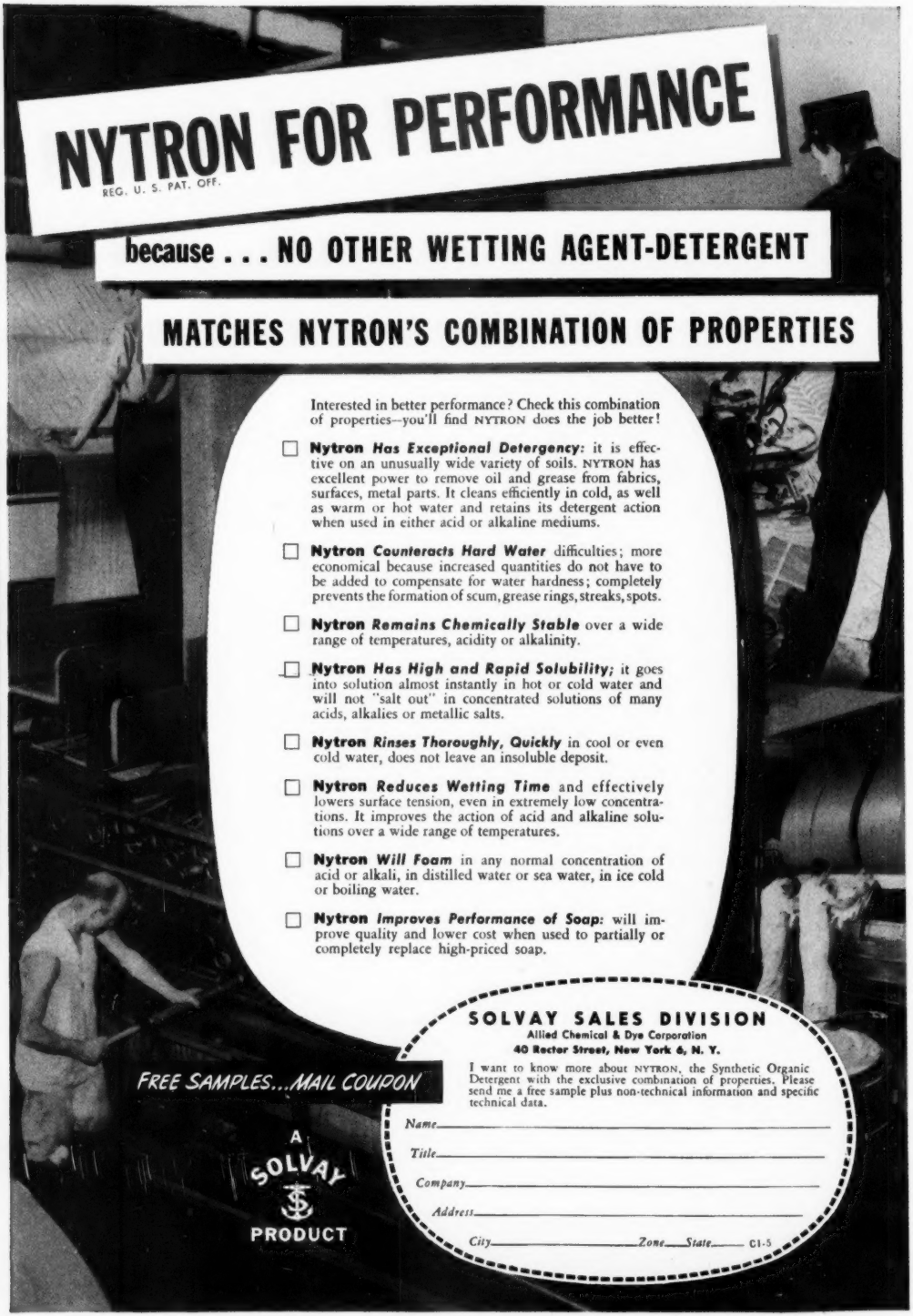
Chemical Industries Week

May 26, 1951

Price 35 cents

A McGRAW-HILL PUBLICATION


NYTRON FOR PERFORMANCE
REG. U. S. PAT. OFF.
because . . . NO OTHER WETTING AGENT-DETERGENT
MATCHES NYTRON'S COMBINATION OF PROPERTIES
Interested in better performance? Check this combination of properties—you'll find NYTRON does the job better!
☐ Nytron Has Exceptional Detergency: it is effective on an unusually wide variety of soils. NYTRON has excellent power to remove oil and grease from fabrics, surfaces, metal parts. It cleans efficiently in cold, as well as warm or hot water and retains its detergent action when used in either acid or alkaline mediums.
☐ Nytron Counteracts Hard Water difficulties; more economical because increased quantities do not have to be added to compensate for water hardness; completely prevents the formation of scum, grease rings, streaks, spots.
☐ Nytron Remains Chemically Stable over a wide range of temperatures, acidity or alkalinity.
☐ Nytron Has High and Rapid Solubility; it goes into solution almost instantly in hot or cold water and will not "salt out" in concentrated solutions of many acids, alkalies or metallic salts.
☐ Nytron Rinses Thoroughly, Quickly in cool or even cold water, does not leave an insoluble deposit.
☐ Nytron Reduces Wetting Time and effectively lowers surface tension, even in extremely low concentrations. It improves the action of acid and alkaline solutions over a wide range of temperatures.
☐ Nytron Will Foam in any normal concentration of acid or alkali, in distilled water or sea water, in ice cold or boiling water.
☐ Nytron Improves Performance of Soap: will improve quality and lower cost when used to partially or completely replace high-priced soap.
FREE SAMPLES...MAIL COUPON
A SOLVAY PRODUCT
SOLVAY SALES DIVISION
Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.
I want to know more about NYTRON, the Synthetic Organic Detergent with the exclusive combination of properties. Please send me a free sample plus non-technical information and specific technical data.
Name
Title
Company
Address
City Zone State C1-5

Chemical Industries Week

May 26, 1951

Volume 68 Number 19

Chemical Industries Week (including Chemical Specialties) is published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office: 1309 Noble St., Philadelphia 23, Pa.**

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 18, N.Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions to Chemical Industries Week are solicited in the chemical and process industries only from management men responsible for corporate affairs, purchasing, sales, marketing, packaging, research or chemical functions. Position and company connection must be indicated on subscription order. Address all subscription communications to J. E. Blackburn, Jr., Director of Circulation. Allow ten days for change of address.

Single copies 35¢. Subscription rates — United States and Possessions $5.00 a year; $8.00 for two years; $10.00 for three years. Canada $6.00 a year; $10.00 for two years; $12.00 for three years. Pan American countries $7.00 a year; $11.00 for two years; $14.00 for three years. All other countries $20.00 a year; $30.00 for two years; $40.00 for three years. Entered as second class matter April 5, 1951, at the Post Office at Philadelphia 23, Pa., under the Act of March 3, 1879. Printed in U.S.A.

OPINION. . . . .

Teaming Up with Industry

To THE EDITOR: I have wanted to tell you for some time how much I enjoy your new set-up of Chemical Industries Week. It is an interesting and most useful publication. The editors seem to be alert . . . know what is going on in the industry . . . properly gauge the important events—the shortage of sulfur, the benzene/toluene shortage, bigger role for maleic, the growing importance of acetylene, the growing importance of the new giant—acrylonitrile and its co-polymers.

I realize that these things don't just "happen", there are plans behind it . . . your paper is able to team up with industry . . . bring us news items which we would not hear of without your cooperation. The interesting thing about it all is that you are there with the facts and news *right now* and not in two months or a year. . . . The timing is good. I always thought you were pretty good, but I was wrong—this is *very* good!

GASTON DUBOIS
Consulting Chemical Engineer
St. Louis, Mo.

To Reader and much-honored chemical engineer DuBois (formerly executive vice-president Monsanto Chemical Co., Perkin Medallist, etc.), CIW's —blushing—thanks.—ED.

Feed to Food

To THE EDITOR: . . . the article entitled "'Wonder Drugs' Snag New Laurels," (April 7) is a very timely subject, and one which you have covered very well. It is a problem on which we ourselves have spent a great deal of time in the past few years . . . the large amount of research work is justified if it can promote animal nutrition, and through this aid the cause of human nutrition.

Recently we have become far more conscious of the fact that both man and animals draw upon the same basic food supply—the products of the soil. Despite the fact that animals concentrate the nutrients of food crops into more palatable and nutritious forms of human food, they do waste the basic food resources in the process.

The antibiotic industry has helped reduce this waste by introducing feed supplements which increase the efficiency of the conversion of feed to food.

The use of antibiotic feed supplements has introduced many new problems in animal nutrition, which call for extensive research. The rapid growth in the weight and size of animals may change our present ideas about the nutrition requirements of farm animals . . . they may have to be revamped upward. Further study may be needed on the balance between antibiotic supplements and vitamin requirements.

It is also possible that the accelerated growth may accentuate the limiting effect of factors (as yet unidentified) . . . required for complete development of the animal to maturity. All of this work will take a long time to complete . . . it is highly probable that more new and exciting factors may be discovered before the complete story has been developed.

T. S. CARSWELL
Vice President
Commercial Solvents Corp.
Terre Haute, Indiana

Silicate Roster

To THE EDITOR: The round-up on sodium silicate in your issue of April 28, 1951, was very interesting. Many of us here enjoyed reading it.

Just to keep the thing in perspective, I'd like to call your attention to the fact that Du Pont has four of the 30 plants you mentioned. These are operated by the Grasselli Chemicals Department, which has a long tradition of activities in the field of sodium silicate.

. . . Actually, Du Pont rates 3rd place in the list of sodium silicate producers.

WILLIAM H. LANDER
E. I. du Pont de Nemours & Co., Inc.
Wilmington, Del.

CIW mentioned that there were 30 silicate-producing plants, eight major chemical companies in the field. Tonnage-wise we rated Philadelphia Quartz in first place, Diamond Alkali in second. Herewith, Du Pont is ensconced in a substantial third.—ED.

No Ideal . . . Yet

To THE EDITOR: Dr. Idson's article (Antihistamines, Mar. 31) serves a very useful purpose in bringing the attention of pharmaceutical manufacturers to this rapidly expanding commercial development.

In a fashion understandable to one not an expert or a specialist in this field he has briefly outlined the history of the subject, pointed out the chemical structures which have proved to be most valuable, discussed sources

. . . . . .

and shortages of raw materials and intermediates and . . . discussed the clinical applications in which these compounds have been most successful.

An important point made is that the ideal antihistaminic has not yet been found . . . there is ample opportunity for further research. Other points to be emphasized are that effectiveness must be determined by clinical trial . . . there are great differences in effect upon individual cases . . . these drugs are not cures, but merely relieve various conditions caused by allergies.

One of the most useful features of this article is the very complete list of antihistamine preparations now being marketed. Personally, I was amazed at the very large number included in this list. . . .

WILLIAM F. HART
Assoc. Prof. Chemistry
Lafayette College
Easton, Pa.

Delaware Chemicals

TO THE EDITOR: We were utterly amazed to see the reported purchase of Delaware Chemicals, Inc., by Reichhold . . . in your article titled, "DOs Take Pentaerythritol".

For the record, Reichhold has purchased no stock in Delaware Chemicals, Inc., has no financial interest in our company. The stockholders are the same and have remained so for the past three years.

We value Reichhold as a customer and a good friend, as are all our customers.

Your inaccurate statement has caused us considerable confusion and embarrassment. Our customers . . . have kept our telephone wires burning to hear our repeated denial of any such purchase as you have indicated. . . .

ARTHUR A. CAROTA
President
Delaware Chemicals, Inc.
Staten Island, N. Y.

CIW, unfortunately, accepted a report from a usually well-informed source and a researcher slipped up in not re-checking the facts. Ours was a gross, completely inexcusable error. —ED.

CIW welcomes expressions of opinion from readers. The only requirements: that they be pertinent, as brief as possible.

Address all correspondence to: The Editor, Chemical Industries Week, 330 W. 42nd St., New York City.

METHYL DICHLOROACETATE has now a limited use as an organic intermediate. The reactions listed below or merely its formula may suggest new possibilities to the inquiring mind. The two chlorine atoms are easily replaced by a variety of organic groups, thus indicating a large number of possible derivatives. This ester has already been suggested specifically in several organic and pharmaceutical syntheses.

$Cl_2CH\ COOCH_3$

KAY-FRIES..

methyl dichloroacetate

KAY-FRIES SPECIFICATIONS . . .

purity	•99.0% minimum
acidity	•.30% maximum
specific gravity	•1.3759-1.3839 at 20°/20°C
refractive index	•1.4374-1.4474 at 20°/D

• Typical reactions of METHYL DICHLOROACETATE •

$Cl_2CHCOOCH_3 + 2NaOC_2H_5 \longrightarrow (C_2H_5O)_2CHCOOCH_3 + 2NaCl$
sodium ethylate → methyl diethoxyacetate

$2Cl_2CHCOOCH_3 \xrightarrow{\text{catalyst}} Cl_2C(CCl_2COOCH_3)COOCH_3 + H_2$
→ methyl tetrachlorsuccinate

$Cl_2CHCOOCH_3 + C_6H_5CHO \xrightarrow{\text{Mg amalgam}} C_6H_5CH_2COCOOCH_3 + Cl_2$
benzaldehyde → methyl phenylpyruvate

$Cl_2CHCOOCH_3 + RCH = CH_2 \xrightarrow{\text{catalyst}} RCH_2CH_2CCl_2COOCH_3$
subst. ethylene → methyl α-dichloro-γ-subst. butyrate

$Cl_2CHCOOCH_3 + 2CH_2(COOCH_3)_2 \xrightarrow{Na} CH_3OOCCH[CH(CO_2CH_3)_2]_2 + 2HCl$
dimethyl malonate → α-di-γ-di-β-mono carbomethoxy propane

For availability and technical information please write or phone

American-British Chemical Supplies, Inc.

Selling Agents For

KAY-FRIES CHEMICALS, INC.

KAY FRIES CHEMICALS INC.

Plant—West Haverstraw, N. Y.

180 Madison Ave., New York 16, N. Y. MUrray Hill 6-0661

Chemical Industries Week
BUSINESS MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

NEWSLETTER

The chemical industry is disturbed by renewed attempts on the part of state governments as well as the Federal Government to impose special taxes on raw materials.

The Texas legislature is still considering bills that would impose taxes on salt and a host of other chemical commodities (CIW, Feb. 24). Another Texas proposal, to raise taxes on sulfur, was finally defeated. The Federal Government is perennially trying to up taxes on oil producers by cutting their depreciation allowance.

Now Florida has jumped on the bandwagon with a bill to impose a 50 cents-a-ton tax on phosphates, 5 cents a barrel on naval stores, 3 per cent on wholesale value of such finished products as turpentine, resins, and pine oil, kraft paper and rayon.

Both the phosphate and forest products taxes have been repeatedly advocated as revenue measures, although the latter would ostensibly be earmarked for development of forest resources.

But industry continues to expand—taxes or not, and this week saw no slackening in plans for new facilities:

Formaldehyde and liquid urea resins will be made by Borden Co.'s Chemical Division in a plant near Demopolis, Ala., to be completed early in 1952. Construction will start within a month. Borden will obtain methanol raw material from the Gulf area, will use the entire formaldehyde output itself for resin manufacture.

A "pilot plant"—with a capacity of 500,000 tons a year—will be built by Oliver Iron Mining Co. (U. S. Steel subsidiary) at Mountain Iron, Minn., to beneficiate taconite ores. Representing a major step in the industry's development of lower-grade ores, the plant will be in operation in 1952. The product—iron concentrates—will be agglomerated at near-by Virginia, Minn., for charging to blast furnaces.

Fine chemicals and pharmaceuticals—a new line for Ansul Chemical Co.—will be manufactured in a new $80,000 plant to be completed at Marinette, Wis., next month.

Increasing demands for methyl chloride (synthetic rubber, silicones, other Grignard reactions) are expected to double output from the present 25 million pounds annually to 50 million pounds. Ansul, which now accounts for about 40% of U.S. capacity, has boosted its production 25% by applying research improvements to its production lines; it will reportedly build another plant if NPA grants quick amortization.

Two other producers—General Electric and Dow—are currently building plants that will add 10 million pounds to yearly output.

Present shortages and increasing demand may soon force transfer of methyl chloride from control under NPA's M-32 order to M-45.

Inflation note: One research lab unwittingly found an easy way to pay for a project. The laboratory work required use of large quantities of platinum, which a year ago cost $66 per troy ounce. When the metal was disposed of after the series of experiments was completed, it brought

$90 an ounce (or as much as $120 on the black market).

The Southwest continues to snag a big share of plant expansions. Kaiser Aluminum & Chemical Corp. has raised sights on its New Orleans installation from $80 million to $145 million. At the same time the company plans to put another $7½ million into its Baton Rouge alumina plant, making that a $14 million total expansion.

This week Atlas Process Co. started building a $3.3 million unit at Shreveport, La., to produce benzene from petroleum. When the facilities are completed, by 1952, they will turn out 17,600 gallons a day. That adds up to a healthy 5 million gallons or more a year.

Lubricant makers are now getting set to make the new all-temperature grease which the Army has adopted for all its vehicles and artillery pieces, replacing six different greases used previously.

The all-temperature lubricant, developed by the Army Ordnance Corps, was tested for three years—including "Operation Greaseball," which involved a 20,000 mile trip in varying climates by a convoy of twelve 2½-ton Army trucks.

Use of the new grease will save 30 man-hours per vehicle now spent in the change-over for Arctic operation. The lubricant is suitable at temperatures ranging from —65 to 125 F.

A man-hour saver in the civilian field is a new dishwashing compound that prevents stains on plastic and china dinnerware.

Named "Salute" by its maker, Wyandotte Chemicals Corp., the new cleaner-destainer prevents stains at 0.25% concentration. Removes old stains at 5% after a few hours soaking.

The new product went on sale this month after field tests.

A lot more phenol will be made next year, according to figures bandied about at a recent meeting of NPA with an industry committee.

Current production is about 335 million pounds a year, and another 25 million pounds capacity will come in this year, but requirements are running about 375 million pounds.

By mid-1952, however, capacity will graze 500 million pounds, and NPA says there'll be enough benzene by then to supply it.

Plastics take 75% of total production (of which 90% is synthetic phenol). NPA has no allocation plans, will depend on DO ratings and special directives to obtain phenol for priority uses.

Several chemicals will enjoy expansion under NPA quick-amortization approval according to the latest list of certifications:

Penicillin, streptomycin and aureomycin facilities costing $20 million (Squibb, Pfizer, American Cyanamid, Cutter, J. T. Baker) received 60%-70% certification.

Sulfuric acid units (Bethlehem Steel, General Chemical, Stauffer) costing $12 million were certified to a 70% extent.

Titanium metal (Titanium Metals Corp. of America: $14 million) got a 90% write-off; chlorine (Hooker: $2.7 million), 50%; coke and coal chemicals (Sloss-Sheffield; $2 million) and benzene (Standard Oil of Indiana: $1.2 million), each 85%; ferric sulfate (Stauffer: $147,000), 50%; and mineral ores (Climax Uranium: $173,700), 90%.

. . . The Editors

U.S.I. CHEMICAL NEWS

May 26 ★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1951

New Combination Combats Viruses, Bacteria, Fungi

A new combination of iodine and polyvinyl pyrrolidone has successfully combated viruses, bacteria, and fungi in over 300 patients, according to the report of a Philadelphia physician. The polyvinyl pyrrolidone detoxifies iodine, so that it can even be taken internally, without destroying its efficiency as a virucide or germicide, the doctor states. He reportedly found that the combination could be administered topically, orally or intravenously without causing burns or other toxic effects.

According to the physician, the combination is odorless, the vapor pressure of iodine is nullified, and it no longer sublimes. Although no color change can be detected when starch is added to the solution, the iodine can be determined stoichimetrically by titration with sodium thiosulfate.

Over a hundred patients with skin infections who failed to respond to conventional treatment were reported successfuly treated with PVP-iodine. Other patients with infections like colds and grippe are said to have improved rapidly after intravenous treatment with the new combination.

New Odor Measurement By Surface Tension Change

Results of recent tests indicate that an instrument might be developed which could classify and measure air contamination at concentrations detected by the nose as strong odors. The experiments are said to have shown that the surface tension of liquid drops of distilled water, mineral oil, and water-stabilized mercury may undergo considerable change because of air contamination resulting from nearby solid odorous material. According to test reports, the surface tension change in a particular liquid follows a pattern characteristic of the contaminant. The same contaminant is said to have produced different changes in surface tension in each of the three liquids tested.

Chemically Treated Paper Prevents Metal Corrosion

A new chemically treated paper is said to be a revolutionary approach to the protection of non-ferrous metals and steel from corrosion. The protective coating, dicyclohexyl ammonium nitrite, is contained in the paper, not applied to the article to be protected. The chemical is described as a white, odorless powder, slightly volatile, giving off a "mothball effect" claimed to prevent entry of moisture and air and to be capable of protecting metals for a very long period of time. The new treated paper is expected to supplant greases used at present to protect military and industrial metal articles.

Vitamin B_{12} Is Found To Improve Ration Containing Fish Meal and Antibiotics

Increased Chick-Growth Results from Addition of Vitamin B_{12} To Rations Containing Fish Meal or Antibiotics or Both

Recent tests conducted at a leading eastern university indicated that the addition of vitamin B_{12} to a ration containing antibiotic, fish meal, or a combination of both gave a significant increase in chick growth. The basal ration used in these tests was an all-plant-protein formulation which was considered to be typical of many commercial feeds now being used in the field. (See figure 1.)

The antibiotics used in the tests were bacitracin, terramycin, penicillin, streptomycin, and aureomycin. Each antibiotic was added to the ration at levels of approximately 9 grams per ton. When vitamin B_{12} was added to the ration it was added to the extent of 12 milligrams per ton in the form of the crystalline material. Any B_{12} present in natural feed ingredients increased the amount present in the ration. When used in the formula, 2.5 per cent menhaden fish meal replaced 2.5 per cent high-protein soybean oil meal. Results are shown in Figure 2.

It can be seen that the addition of 12 milligrams per ton of B_{12} greatly improved the basal ration. Fish meal at the 2.5 per cent level improved the basal ration but to a lesser extent than the B_{12}. When both B_{12} and fish meal were added at the levels mentioned above, both materials gave an additive response which was greater than that obtained when either was used alone.

The use of vitamin B_{12} along with antibiotic also gave results

MORE

BASAL RATION

Ingredients	Amounts
Corn Meal	46.5 lbs.
Standard Middlings	15.0 lbs.
Soybean Oil Meal (50%)	25.0 lbs.
Alfalfa Meal	2.5 lbs.
Butyl Solubles (250)	2.0 lbs.
Limestone	1.0 lbs.
Bone Meal	2.5 lbs.
Salt	0.5 lbs.
Total	95.0 lbs.
Manganese Sulfate	11.35 gm.
A & D Oil (2000A-400D)	10.7 gm.
Choline Chloride (25%)	128.0 gm.
Niacin	900 mg.
Riboflavin Supplement (8 mg./gram)	16.2 gm.
Total	167.15 gm.

Figure 1

Crystalline Vitamin A Synthesized Commercially

Crystalline vitamin A is reported in production now on a commercial scale and is said to be available in a stabilized, high potency, dry form and as a liquid derivative. Commercial synthesis of this vitamin had been too difficult previous to this development; the crystals were too sensitive to air and humidity for practical use. The new process is claimed to stabilize crystalline vitamin A by coating the crystals with gelatin. Stability achieved is said to be so great that the vitamin shows no substantial deterioration when exposed to air at high temperatures for 1,200 hours – the approximate equivalent of three years' normal storage.

The new dry form reportedly will make it possible to incorporate vitamin A in multivitamin pellets and should simplify the fortification of dry goods with vitamin A, which was formerly impractical. Three forms of the crystalline vitamin A will be marketed, including some special forms developed for fortifying oleomargarine.

Bacteria Work in Reverse, Make Cellulose from Sugar

A bacterial process for producing cellulose from cane sugar is reported in operation in England. This is the reverse of the normal process in which bacteria make sugar from cellulose. If this bacterial action can be carried out on the scale of penicillin production from mold, there would presumably be a big yield of cellulose every few days. The English researcher also is said to have bacteria working on starch and sugar products to make dextrose.

New-Type Synthetic Rubber

A new-type synthetic rubber will permit manufacture of high-quality tires with only 75 or 80 per cent of the rubber now being used in conventional cold-rubber GR-S compounds, according to the government. The new development involves the addition of readily available oils to cold rubber GR-S.

CONTINUED

Vitamin B_{12} In Feeds

superior to those obtained when any antibiotic was used by itself. The importance of adequate levels of vitamin B_{12} in a feed can be seen by noting the weight averages of each column in Figure 2. The addition of B_{12} to the basal ration with or without antibiotic (column II) gave a greater general response than supplementation with 2.5% fish meal (column III).

There has been considerable controversy regarding the level of vitamin B_{12} necessary in poultry feeds. The chicks used in this experiment were "crosses" from *normal nondepleted* stock and were obtained from three commercial sources. The birds responded to supplementation with B_{12} at a level of 12 milligrams per ton of finished feed. It is very probable that some chicks require lower levels of vitamin B_{12} than others, depending upon their genetic and nutritional background. The information presented indicated that it would be to the advantage of feed manufacturers to include sufficient amounts of vitamin B_{12} to insure consistently good results under varying field conditions.

Hormone Grows Hair On Bald Heads

Hair an inch long has grown on the heads of two bald men in five weeks following injections of a hormone isolated from hog pituitaries, according to a laboratory research director. Comparable results were reported with about 25 other men whose scalps were tested with a cream containing the hormone. Included in these cases, it is claimed, are some men 55 to 60 years old who have been bald for 25 or 30 years. New hair that has come in is said to be the same color as that which grew before the subject became bald.

The research director believes the hormone acts by regenerating atrophied hair follicles. He pointed out that non-toxic effects have been observed on humans or animals given the new hormones by injection or inunction. Administered parenterally to men it grows hair only on the head, according to the report.

Average Eight-Week Weights by Lots (16 birds) Where Vitamin B_{12}, Fish Meal, and Antibiotics Are Experimental Variables

Soybean Oil Meal %		5	5	2.5	2.5	Ave. by Rows
Fish Meal %		0	0	2.5	2.5	
Vitamin B_{12} Mg./100#		0	.6	0	.6	
Column		I	II	III	IV	
Antibiotic	Mg./100#	Gm.	Gm.	Gm.	Gm.	Gm.
None	0	935	1005	994	1082	1004
Aureomycin	423.5	1032	1113	1096	1118	1090
Streptomycin	454	972	1034	1014	1120	1035
Penicillin	454	1133	1161	1145	1124	1141
Terramycin	454	1017	1091	1075	1113	1074
Bacitracin	313	1054	1061	1070	1109	1074
Ave. by Columns		1024	1078	1066	1111	

Figure 2

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

For control of biological fouling of condensers and cooling towers, a new reagent now being test-marketed, is said to be effective in concentrations of 2 parts per million. Other advantages claimed are ease of handling, freedom from skin irritation, ready missibility with water. **(No. 679)**

A new-type steel drum, described as taller and slimmer than present standard type with a "necked-in" head which permits stacking drums directly on top of each other, is expected to reduce transportation costs, save space, and speed handling. **(No. 680)**

For instantaneous detection of fire, a new system reportedly does not depend on heat or smoke as indicators, need not be directly exposed to fire, can detect smallest of fire yet not be affected by sunlight or artificial illumination. **(No. 681)**

Sugars labeled with radioactive carbon atoms at specific positions within the molecule are the object of a new project. They can be used to make labeled samples of other carbohydrates such as starch or cellulose. **(No. 682)**

A new ultrafinely divided adsorptive powder (a hydrated aluminum magnesium silicate), described as low-cost, dry, free-flowing, chemically inert, and essentially neutral, is expected to find use as a filler, flattener, conditioner, coater, polisher, strengthener, and bodying agent. **(No. 683)**

A new drug for treating shock has reportedly been found in clinical trial to prevent fatalities that might otherwise occur from lowered blood pressure. **(No. 684)**

New serpentine flexible electric heating units reportedly can be applied to pipes, valves, cylinders, and containers carrying viscous or free-flowing fluids or gases, and can operate at temperatures approaching 1,000°F. for long periods. **(No. 685)**

For brominating olefins in the allyl position, for oxidizing secondary alcohols to ketones with specificity, and for adding HOBr or Br_2 to double bonds depending on conditions employed, n-bromoacetamide is now available commercially. **(No. 686)**

A new labeling machine for 5-gallon steel drums to eliminate costly hand labeling is said to do both spot and wrap-around labeling at 18 drums per minute. **(No. 687)**

An organic nonionic thickening agent for cream and liquid shampoos tends to reduce foam less than other agents, it is claimed. **(No. 688)**

MANUFACTURER'S WAREHOUSE: Buyers temporize, stocks pile up.

Buyers Motto: Wait and See

Price and allocation uncertainties are slowing movement of chemicals from makers to buyers.

Attitude is developing: Let manufacturers carry the inventories until the picture is clearer.

Some chemical shortages are very real, but others are deceptive—i.e., more orders on the books than actual demands.

All around the country this week chemical purchasing agents are finding the going easier, while salesmen are buckling down to tough work.

That's not 100% true, to be sure, for it's still practically impossible to find uncommitted supplies of such chemicals as phenol, fluorspar, sulfuric acid, and nickel salts; but the supply-demand balance has shifted markedly towards equilibrium during the past couple of weeks.

There has been a noticeable easing of soda ash, ammonia, liquid caustic, chromic acid, toluol and most heavy acids. It's a little easier now than it was a month ago to find solid caustic, chlorinated chemicals, glycerine, alcohol, zinc salts and dichromates—but locating these chemicals still keeps purchasing agents busy.

These spot checks from all over the nation are subject to argument, of course, for conditions vary from area to area on specific items. But there's no gainsaying the consensus that the most frantic phase of the fight for more production is over. Right now it's more a matter of bringing sellers and buyers together—on more or less equal terms.

Multiple Orders: There are several reasons behind the change in the weather. One of them, multiple orders, is reminiscent of the car-buying spree after the war, when hankering motorists signed up with every dealer in town and took the first car that came along.

Such multiple ordering of chemicals, followed by cancellation of all except the first delivered, is not a major factor in the current situation; but it is contributory. A Cleveland sales manager confirms this: "The shortage is somewhat artificial because manufacturers are ordering from several suppliers and then cancelling when they receive material from one." In Houston, suppliers report that some Mexican buyers are notorious for this practice, but it doesn't bulk large for domestic purchasers.

Price Uncertainty: "Large operators seem to be watching for a price rollback," reports a chemical sales official in the Chicago area. "There have been more holdbacks this month than ever before—probably due to price controls." A sales manager in Ohio similarly reports: "Price rollbacks are a real factor. Eveyone is waiting, or else asking for guarantees on any possible lower prices, and nobody wants to issue any guarantees."

There is a reasonable expectation that the price rollback on chemicals will be deferred until June 28 (*CIW Newsletter, May 19*). No chemical manufacturer would deny the validity of arguments for delay; but at the same time it prolongs the period of uncertainty, slows business until results of the edict can be evaluated.

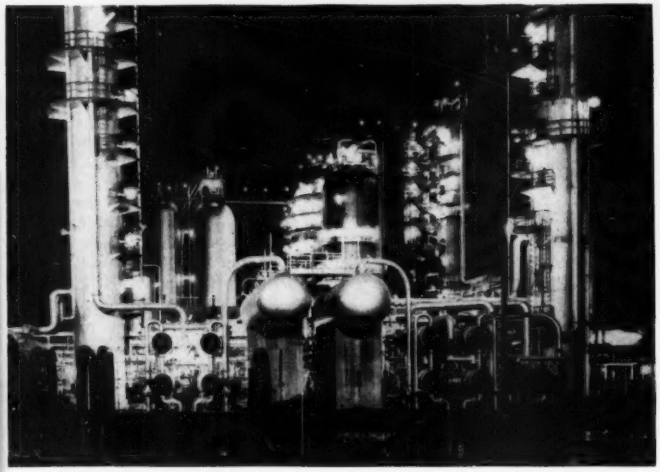
Inventory Shift: Customer's natural inclination under these circumstances is to let manufacturers carry inventories. Most customers have as large inventories themselves as they've been able to accumulate over the past year, but now they're living off them, anticipating price declines. One industrial chemical maker in the East last week found himself with 250,000 pounds of a certain chemical (nameless since he's the only producer) available for sale. A month ago the sales manager could have made one telephone call, and the customer would have bought it for his inventory; but this time he spent a whole day finding a taker.

All sections of the country report that customers are now largely buying only what they need—or what alloca-

tions, either formal or informal, allow them.

Not All Agree: Some firms expect shortages to worsen in the fall, when defense production gets rolling at a faster pace; and they're taking what they can lay their hands on at whatever prices are currently asked. Their stockpiles create apparent shortages of items actually in adequate supply.

But the majority, by and large, think that when demand rises, new production will be on hand to meet it—and perhaps at a lower price. Therefore they're holding off — and turning an indifferent ear to the blandishments of hard-talking chemical salesmen.



NIGHT WORK IS NOT ENOUGH: More basic petroleum refining capacity is answer.

Needed: More Basic Refining

Within the past few weeks many petroleum experts have begun to sound a call for the expansion of the basic refining capacity of the U.S. This increase, they argue, will be needed if a "butter and guns" philosophy is to work . . . if both military and civilian demands for fuel oil, asphalt, waxes and lubricants are to be met.

An increase in the basic refining capacity of the country was cited this week as an immediate need by Bruce K. Brown, deputy administrator of the Petroleum Administration for Defense. He defined basic refining capacity as the capacity to convert crude oil and other raw materials into the usual, not specialized, petroleum products such as gasoline, heating oils, asphalts and waxes. It is this basic refining capacity, Brown pointed out, that sets the pace for the whole petroleum industry . . . special products, such as aviation gasoline, included.

More Needed: Actually there was a very sizable increase in basic refining capacity between the end of World War II (V-J Day) and the beginning of the Korean fracas. The trouble is that it wasn't enough of a boost.

The pre-Korea daily capacity of all U.S. refiners was about 6.75 million barrels of crude oil and other raw materials. This was 1.5 million barrels greater than the capacity that existed at the close of World War II. But the Petroleum Administration for Defense has reached the conclusion that unless 700,000 barrels a day of new capacity are added by the end of next year . . . a petroleum product pinch will take place.

Financing: The big problem is that of how the required additional capacity should be financed . . . by government or private industry? PAD's answer is to let industry try to handle the financing first, but with some government assistance in the form of permission from the Defense Production Administration to accelerate the normal period of depreciation of the cost of new refining equipment. This would work to reduce the usual 12 year period of depreciation to the span of 5 years permitted by law. DPA has already agreed to the main parts of this plan.

Alternatives: If the all-industry financing approach doesn't work out, Defense Loans would probably be the next resort. The Defense Production Act of 1950 provides for these loans which are usually of a type or amount that neither private bankers nor the RFC would consider a prudent risk.

The erection of government-owned plants for private operation would be the final resort in the attempt to increase the basic refining capacity of the country. But at this date the PAD is not convinced that either of the two alternatives to private financing will be necessary. In fact the agency points out that it would indulge in a lot of thorough analysis of the situation before suggesting that either of the two alternative plans be used.

Exception: In World War II the Defense Plant Corporation built about 20 special 100 octane gasoline plants. PAD has recommended to Congress that a similar corporation be formed now. The reason given is that this type of organization could take care of the financing of those special plants needed to manufacture certain products for which the peacetime demand is either non-existent or very small when compared to the indicated immediate demand. Throughout all its reasoning it is evident that PAD is loathe to lean on the taxpayers . . . until absolutely necessary.

New Patent Code

The finest codification and revision of the patent laws since the seventies moved a step nearer realization with the introduction of the Bryson Bill, H. R. 3760. Hearings begin June 13.

The Bryson Bill, introduced on April 18, is a revision of H. R. 9133 (*CI, Dec. 1950*) upon which action was not completed in the last session of Congress.

Retained: Provisions of H. R. 9133 retained in the new bill include:

1. A new use of a known compound may be patented as a method (adds: also new use of a known process, machine, and manufacture).
2. A contributory infringer may be held liable.
3. Patentibility is not negated by the manner in which the invention is made.
4. Intervening rights where patents are reissued are protected.

Omitted: The new bill leaves out the following proposals which were in the previous bill:

1. Publication of pending applications.
2. Patents of addition.
3. Making or using a patented invention solely for experimental or research purposes without liability or infringement.
4. Right of choice to sue the U.S. Government in the district courts in cases where the government or its contractor uses a patented invention without a license.

Added: New provisions, not present in H. R. 9133:

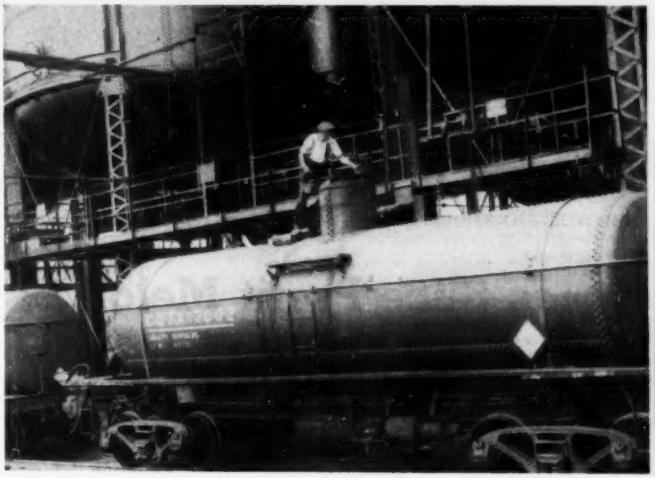
1. Permits dedication of all or a terminal part of the 17-year term of the patent granted or to be granted. This provision, it is believed, will save a later granted patent from being held invalid, or a later filed application from being turned down for double patenting—i.e., for extending the term of protection on the invention covered by a previously granted patent.
2. Permits the filing of an application by a party other than the inventor, i.e., by some one who can show a proprietary interest in the patent, e. g., an assignee, where the inventor refuses to execute an application for a patent or can't be found or reached after diligent effort.
3. Neither of the joint owners of a patent may grant licenses or assign his interest, or any part thereof, without the consent of the other owners or without accounting to them. Under the previous bill no consent or accounting was required.
4. A patent owner would be given two years from the grant of the original patent instead of one, as under H.R. 9133, to file for broader claims in a reissue application. However, intervening rights would be protected which were acquired prior to the grant of the reissue patent, rather than prior to its filing date as under H.R. 9133.
5. The tendency of the courts to knock out patents on the technicality that the claims define the invention in terms of function, may be curbed by a provision that such claims shall be construed to cover the corresponding structure, material or acts described in the specification and equivalents thereof. At least the inventor would have that much protection if the patent were otherwise valid.

Passage of H.R. 3760 is expected to go far in simplifying the complex structure of our present patent laws.

Smelter Sulfur Eases Shortage

Gloomy sulfur prospects spur Canadian Industries Ltd.'s plans for a new plant to make liquid sulfur dioxide from by-product smeltering gases. Sulfite pulp, newsprint, and sulfuric acid manufacturers will be prime consumers.

Canadian industry now imports sulfur dioxide from the United States, but ican sulfur is short, and will get shorter before relief is in sight. Output of the Copper Cliff plant will reduce import needs—two tons of sulfur dioxide will replace one ton of elemental sulfur—and help the Canadian sulfite pulp and newsprint industry maintain its position as major earner of U. S. dollars.



LOADING SULFURIC AT COPPER CLIFF: Sulfur dioxide will be a welcome companion.

high cost prevents little more than a trickle from crossing the border. CIL's new plant will mark Canada's first sizable liquid sulfur dioxide production capacity—although it will not be the first time the material has been manufactured in the Dominion. Canadian Industries Ltd. was in the business in a small way from 1932 to 1945.

CIL's new development will bring sulfur dioxide back in tonnage quantities, at a fraction of its present cost. A new process will make the pungent liquid from gaseous by-products of International Nickel Co.'s Copper Cliff (Ont.) smelter. Production is estimated at 90,000 tons a year when the wheels begin to turn. Output of sulfuric acid, also from Inco's by-product gases, will concurrently be expanded this year.

No Secret: A reliable source of cheap sulfur dioxide will do much to smooth the brows of Canadian manufacturers, wrinkled by worry about darkening sulfur prospects. They now import elemental sulfur from Texas and Louisiana to the tune of 385,000 tons a year. It's no secret that Amer-

Liquid sulfur dioxide will also have process advantages over elemental sulfur. A direct source, the liquid will obviate the necessity of burning sulfur to sulfur dioxide gas. Mill-scale tests at the Abitibi Power and Paper Co.'s Mission Mill proved the worth of the liquid product and underscored its edge over solid sulfur.

Almost 20 years ago CIL built a pilot-plant at Hamilton (Ont.) to convert smelter fumes to liquid sulfur dioxide. Technically, the effort was a success. But costs were too high to compete with elemental sulfur. International Nickel's development of its new oxygen flash-smelting process, however, threw new light on the situation. CIL engineers believed it now could be done—and cheaply. They were right. Economic feasibility of large-scale production was demonstrated by pilot operation at CIL's Copper Cliff Chemical works, adjoining the Inco smelter.

The new plant, next door to its raw materials, won't supply all of Canada's needs. But with sulfur on the critical list, it is a welcome step in the right direction.

EMPLOYEE-STOCKHOLDERS gather to hear progress report on "their" company.

Firms Slice Profit Melon

Profit-sharing plans of Procter & Gamble and Minnesota Mining and Manufacturing Company receive wide attention.

3M reveals employees will receive over $500,000 of first quarter profits of company this year.

P&G has two plans; both stress stockholding by employees, incentives, and building of "estates."

Profit-sharing as an aid to sound industrial relations is currently getting a lot of consideration by chemical managements. As a result, attention is being focussed on the successful plans of two of the oldest companies in the business of whacking up profits with employees: Proctor & Gamble and Minnesota Mining and Manufacturing Company.

This week, for instance, 3M made news by revealing that their employees' share of first quarter profits this year amounts to over $500,000.

A breakdown of the statement shows that checks for $364,425 were distributed to 6,629 employees in the company's plants and offices in 29 cities. Under the terms of the plan an additional $158,321 was used to cover the cost of employee hospitalization and disability insurance.

In addition to these "slices of the melon" 3M also distributed profit shares to approximately 200 employees who left their jobs on military leave during the quarter.

Taxes Hurt: These first quarter payments marke the 57th consecutive business quarter in which employees received a share of company earnings. The total outlay this time, however, was below the record $668,178 disbursed for the last quarter of 1950.

R. P. Carlton, president of 3M, explained that the slack-off was due to federal taxes which lowered the amount available for profit-sharing. In spite of the fact that the company decided not to deduct excess profits taxes, said Carlton, the higher normal tax rates now in effect imposed an extra burden on profits "and therefore on employee profit sharing."

P&G Old Timer: At Proctor and Gamble profit-sharing started in 1887, making the company one of the oldest concerns in the country to cut employees "in." Because of the plan, thousands of employees now hold stock in the company and each year's passing brings more employee-stockholders into the fold.

Two Plans: Actually there are two profit sharing plans at P&G. The first is for employees earning not more than $375 per month and with at least one year of service in the company. This plan is known as the "dividend" plan. The second plan, called the "trust" plan is for salaried employees who earn more than $250 a month and who are not already in the dividend plan.

Dividend Plan: Under the terms of the dividend plan, the employee during the first six months of participation contributes 5 percent of the first $2000 of his earnings. The company adds to this contribution that starts at 5 percent and increases to 7 percent at the end of six years. This accumulated fund is used to buy common stock, which at the end of the six years is delivered to the employee.

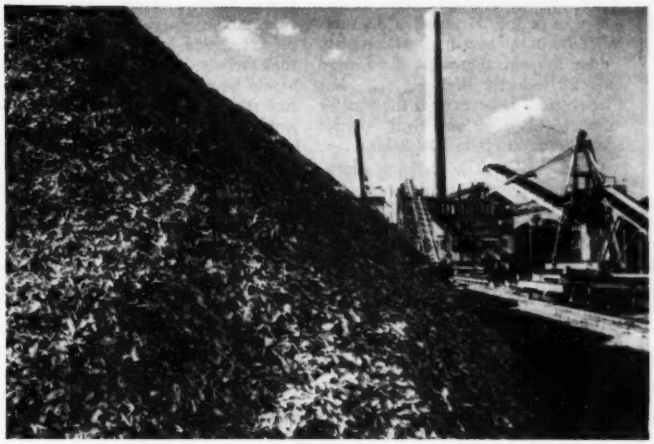
At this point, the employee stops contributing. But the company continues to pay him quarterly profit-sharing dividends in cash. The profit sharing rate continues to increase up to 15 percent on earnings up to $2000 after 15 years of participation.

But the plan doesn't end here. There are also profit-sharing credits financed by the company and based upon earnings in excess of $2000 per year, years of service and company profits. This money is primarily a retirement-income building fund. It is held in trust for the employee until he retires or until death or total disability. It forms a growing income which can be added to the minimum or base $75 pension provided by the company pension plan and social security.

Trust Plan: The trust plan differs from the dividend plan in that it is entirely financed by the company. Eligible employees begin participating after two years of service. Under the terms of the plan annual credits are invested in securities which are held for the employee until his retirement. This, company officials claim, provides added incentive for P&G employees to work harder for the success of the company. But most important, it gives them a chance to build an estate . . . a neat trick in these times.

"Dividend Days": Twice a year, P&G holds "Dividend Days." At these gatherings, employees and their families hear reports on how the company is doing. Although dividends are not passed out at the meetings, the reports given deal with the things that make the dividend possible.

In a sense, these conclaves are "employee-stockholder" meetings . . . with emphasis on stockholding. The company's stock has been split so many times that one share bought in 1890 and held would now be represented by 400 shares. Profit sharing makes capitalists.



LIMESTONE: Abundant and cheap for an expanding chemical industry.

More Lime, Cheaper Haul

To meet increased requirements of the chemical and steel industries, this week management at Kelley Island Lime and Transport Co. (Cleveland) is concluding final plans for a $1.5 million lime plant in Buffalo. The new plant, however, is but one phase of the company's $12 million plans for expansion. Others: a lime plant in northern Ohio, a refractory plant, opening of limestone quarrying facilities in Royal City, Michigan.

Kelley Island's present plant in Buffalo will be dismantled (officials call it "practically obsolete") and the new one built on the site. With a rated annual capacity of over 100,000 tons, the new unit will boost production by 40,000 tons per year.

But Kelley Island President Ralph Dickey envisions more in the way of expansion than a new plant in Buffalo. A keen observer of the rapidly expanding chemical industry in the Ashtabula-Painesville (Ohio) area, he has decided to build another lime plant there.

Many of the large chemical companies operating in the neighborhood of Ashtabula and Painesville are already using Kelley Island lime as a basic raw material (Diamond Alkali and the Electro-Metallurgical Co. of Union Carbide are two). But some lime consumers have been hauling it by rail from points as far away as Missouri.

To astute businessman Dickey, this doesn't make sense. His company has ample reserves of high grade limestone near Royal City (Mich.) which can be transported all the way by lake carrier.

Another item on the expansion list is a new refractory plant. The plant will double the production of the company's refractory material secured from holdings at Gibsonburg near Toledo.

Limestone: To supply the new lime plants as well as to furnish an expanding iron and steel industry with its huge requirements of limestone (900 lbs. of limestone per ton of pig iron produced), Kelley Island will reopen its Royal City quarries. No estimates of the reserves there are available, although it is known that a 140-ft. stratum underlies the several hundred acres that comprise the company's holdings. And the material analyzes at not more than 1% silica, 1.5% alumina and 0.1% sulfur.

Expansion of quarrying facilities will take the bulk of the $12 million plans for expansion—about $7 million. Since the economies of the operation call for all-water transportation, a portion of the funds will go toward the construction of piers large enough to accommodate the 600-ft. lake carriers.

Not all the necessary capital will come from Kelley Island's own coffers. Dickey has persistently reminded the big steel companies that metallurgical-grade limestone is not as plentiful as other grades. To assure the industry of a steady source of the high grade material, five steel companies (Republic, Bethlehem, Youngstown Sheet & Tube, Wheeling, and Weirton) have agreed to help Dickey financially with the expansion program.

In this manner, the steel industry gets its constant source of stone, Kelley Island gets financial help and steady customers. And the chemical industry gets the benefit of new lime plants with a guaranteed source of high-quality, cheap, and abundant raw material.

NPA Quartet

The National Production Authority has just completed the top level reorganization needed to gear it for the rigors of the Controlled Materials Plan (in effect July 1). The revamping also had the purpose of delegating more of the authority of the NPA Administrator down the line to the operating chiefs.

With the appointment this week of Francis J. Curtis, a Monsanto vice-president, to head the Chemical, Rubber and Forest Products Bureau of the NPA, Administrator Manly Fleischmann's re-designed organization is ready for action. Under the new setup, there are four Assistant Administrators (Curtis' new title). All of NPA's industry divisions will be divided among this quartet. Curtis' bureau will include the following division: Chemical, Lumber and Lumber Products, Pulp, Paper and Paper Board, Printing and Publishing, Containers and Packaging and Rubber.

Executive Group: Actually, the four Assistant Administrators will serve as

F. J. CURTIS: Chemical industry gets a strong voice on NPA quartet.

the executive committee of the NPA. They will, as a group, head up the activities of the 35 industry divisions called for in the new organization plan. Under the old alignment there were only 20 industry divisions . . . but Fleischmann believes that the greater number of divisions will permit specialization in industrial fields.

Good Choice: The chemical industry is quite pleased with the appointment of Curtis to the new high policy post. He has an international reputation for sound thinking on chemical management problems and has proven familiarity with the plight of the chemical industry in the present mobilization situation.

Curtis recently returned from England where he represented NPA on a two-man team that studied the British use of American sulfur and suggested ways of conserving sulfur and of developing new sources of sulfuric acid. And in these days of sulfur shortages any man who can do that seems well qualified for the toughest job official Washington can bestow.

Youngsters Needed

Young men—of military age during the last war—have made enormous contributions to human welfare. Randolph T. Major, Merck vice president and scientific director, cited this last week upon receiving the Industrial Research Institute's 1951 Medal and called for a policy of continuing scientific work in wartime.

Major posed the question: "How many people do you think would be receiving cortisone today if 24-year-old Lewis Sarett had not been deferred from military service in 1942 to work on the steroid hormone? My guess is that there would be none, and that it would have been years from now before cortisone would have been made available—perhaps never."

RANDOLPH T. MAJOR: A deferment speeded cortisone.

He cited examples of three other young men—all under 30—who had done work leading to synthesis of vitamin B_{12}, production of penicillin, discovery and development of streptomycin. Naming other recent drug discoveries, he contended that "every one . . . would not have found its place in therapy nearly as soon, or perhaps not at all, if competently trained, imaginative young men had not been available for work on them."

"Let us hope," he concluded, "that our country's policies will always permit the suitable training of such people and the utilization of such men along the lines of their training, even during war."

Pleas, Plaints Hit OPS

The office of Price Stabilization officially stated this week that the chemical industry is having "pricing difficulties under Ceiling Price Regulation 22" (*CIW, May 5*). To perspiring, perplexed chemical executives straining to meet the May 28th deadline set by the order, it was the greatest understatement to emerge from official Washington in many months.

Chemical companies are besieging the OPS with pleas for some relief . . . any relief. They claim it will be physically impossible for most companies to make all the computations necessary under the regulations and file the ceiling prices by the deadline date.

Tailored Pricing: The chemical industry, as represented by a consensus of members of the Heavy Chemicals Industry Advisory Committee which met on May 15th, wants a tailored pricing regulation. This, they argue, is necessary because of the great diversity of industry products and the rapid fluctuation in prices and changes of sources of supply of many basic raw materials.

The industry group petitioned OPS to continue operating under the General Ceiling Price Regulation (GCPR) until a tailored regulation can be issued. If this can't be done the chemical group has asked the OPS to hold off on CPR 22 until August 1 to give them a chance to complete the laborious and elaborate calculations necessary.

Criticism: Chemical executives have hurled caustic remarks at the OPS for its lack of "business know-how." One point on which they are particularly enraged is that CPR 22 doesn't provide enough allowance for present and future high maintenance costs.

Representatives of the major companies who constituted the advisory committee presented a solid front to OPS officials on several other points. They contended that the defense effort has placed a large load upon the production facilities for the manufacture of heavy chemicals which has required and will continue to require the use and development of alternate raw materials and techniques. And this situation will in turn distort normal production costs to an extent not envisioned under CPR 22.

"What about that?" the industry asks of OPS. The answer is yet to come.

EXPANSION . . . .

Great Lakes Carbon: A 75% increase in capacity by the summer of 1952 will result from the installation of 40 coke ovens at the Merchant Coke plant. And the increased production of coke will bring an equivalent increase in output of by-product coal tar, ammonium sulfate, nitration and industrial pure grades of benzol, toluol, xylol, crude light and heavy solvent.

•

P. & G.: DPA has approved a certificate of necessity (65%) for a $21.5 million plant for the Buckeye Cotton Oil Co. (a Procter & Gamble subsidiary). P. & G. officials, however, say the proposed plant—to produce cellulose from wood pulp—has gone no further than the "let's talk it over" stage. The company has taken an option on timberland near Perry (Fla.), but the board of directors has not given the final okay.

•

Interlake Iron Corp.: Plans have been revealed for the construction of an ammonium sulfate plant at the Chicago coking plant. Waste ammonia will be utilized; and although no official statement has been made as to the source of sulfuric acid, a good guess would be General Chemical, located only a few miles away and operators of a tank truck service in the Chicago area.

•

Liberty Powder: Badger Ordnance Works' $125 million plant near Baraboo, Wis., will be reactivated immediately. Liberty Powder Co. (sub-

BUSINESS & INDUSTRY . . . . . .

sidiary of Olin Industries) will operate the plant under a fixed fee contract.

•

Standard Oil (Ind.): The Sugar Creek (Mo.) refinery will be expanded to produce 68,000 bbl. daily (presently rated at 38,000 bbl.). Preliminary work has already begun, but the production schedule doesn't call for the major portion of the work to get under way until late this year—completion at the end of 1952. Expansion of basic refining capacity was needed there and Sugar Creek is strategically located, had catalytic cracking capacity available.

•

Linde: The Tonawanda plant will boost production by 100%—through new facilities, a 50% increase in employment, and longer working hours. Presently operating on a 40-hour work week, the plant switches to a 48-hour week on June 1.

KEY CHANGES . . .

K. T. Price: To assistant vice president, southern operations, Freeport Sulfur Co.

Z. W. Bartlett: To assistant general manager, southern operations, Freeport Sulfur Co.

B. A. Axelrad: To general superintendent of the Hoskins Mound (Tex.) plant, Freeport Sulfur Co.

Granville A. Perkins: Foam director of research to vice president in charge of research, Carbide and Carbon Chemicals Co.

Clement A. Damen: To manager, Witco Chemical's Washington office.

George V. Dupont: To manager, Central Engineering Department, Diamond Alkali Co.

John A. Hassinger: From assistant district manager, Pfizer, to manager, Pfizer, Canada, Ltd.

Stuart E. Kay: To vice president, International Paper Co.

F. Henry Savage: To vice president, International Paper Co.

Louis N. Markwood: To chief of Chemical Division, Office of International Trade.

Victor H. Turkington: To director of research, Bakelite Co.

Charles W. Crawford: From deputy commissioner to commissioner, Food and Drug Administration.

Ralph L. Carr: To manager, Technical Service Department, Mathieson Chemical.

A. Griffin Ashcroft: To vice president of research and development, Alexander Smith's Carpet Division.

Grant Keehn: to board member, Archer-Daniels-Midland Co.

E. I. Stearns: To assistant director, Application Research Department, Calco.

Charles E. Crompton: To head up Applied Radioactivity Division, U.S. Testing Co.

Donald E. Springer: To assistant chief engineer, Hooker Electrochemical.

Warren A. Lacke: From assistant manager to manager of industrial relations, Continental Can.

James M. Knox: To vice president, Research Corp.

H. E. Bayer: To general superintendent of construction, Blaw-Knox Chemical Plants Division.

Eugene F. Bertrand: From sales manager of the Drug and Chemical Industries Division of Owens-Illinois Glass, to Assistant Administrator of the Defense Production Administration.

Warren A. Beman: To direct chemical products development for Socony-Vacuum.

FOREIGN . . . . .

Canada: The search for sulfur sources continues this week as the government issues the second sulfur prospecting permits; the first was issued to Sunbeam Sulfur Ltd. (*CIW, April 28*). The new permit—to Holdings Administrators, Ltd.—covers about 99,613 acres of land north of Edmonton. It specifies a rental fee for the first year (of the two-year permit) of $11,525, requires an expenditure of $50,000 on exploration for each year.

•

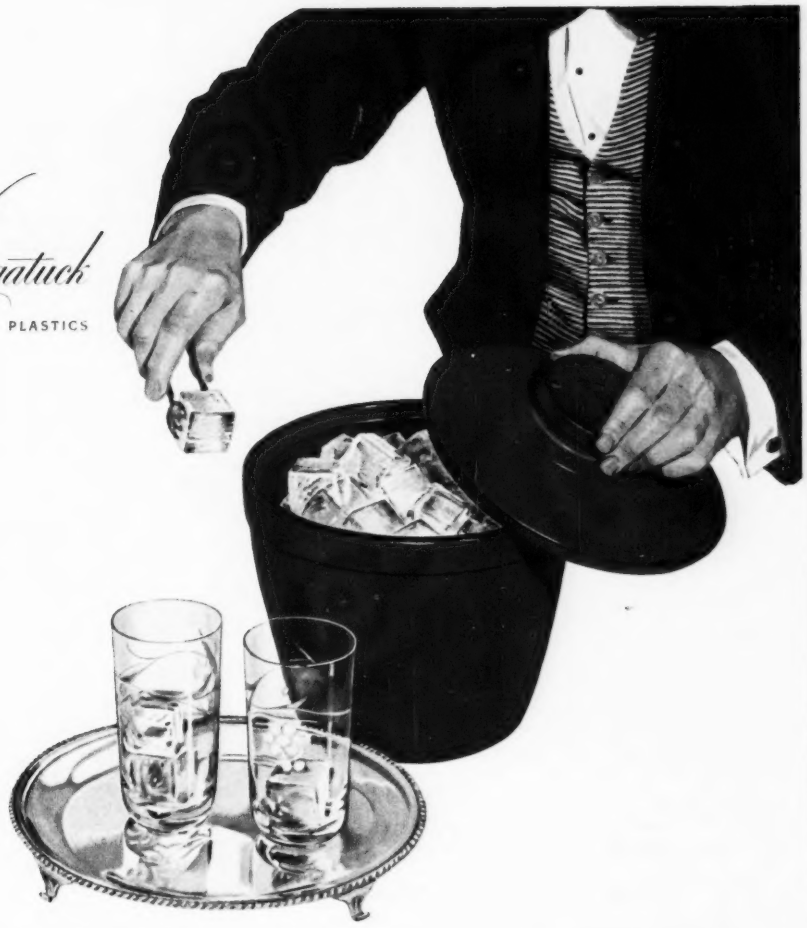
Argentina: Armour and Co. will soon open its new plant in Buenos Aires. The plant will utilize Argentine raw materials to produce insulin, ACTH, and trypsin. About 20% of the capacity will fill domestic needs, the remainder will be available for export. Armour says the prime motivating factor is to obviate the same type of world shortage of insulin that existed during early years of World War II.

•

Brazil: Fontoura-Wyeth (subsidiary of Wyeth, Inc.) will start work in a $2 million laboratory for producing penicillin and for converting it into forms suitable for medical and veterinary use. The lab, to be located in Sao Paulo, will be the first of its kind to be constructed in the country by U. S. producer.

Naugatuck

ROYAL FAMILY OF PLASTICS



Naugatuck Marvinol lifts the lid on your plastic future

There is a good deal more than ice cubes in this unusual bucket made of Marvinol vinyl resin.

If you look into it, chances are you'll find a whole "bucketful" of promising ideas for *your* product future.

Look what Marvinol did for this product! In the new cellular form, this "n'Icer"* Bucket is "finger-lift" *light* . . . so *flexible* it can squeeze apart clustered ice cubes . . . so *insulating* that the ice cubes are 90% themselves after four hours! It won't *tarnish*—is *unbreakable*, is *lovely* to look at and can be made in all colors—a perfect compliment to any table. It *imparts no odor or taste*.

As you read about Marvinol-made ice buckets, perhaps you can visualize what Marvinol may do to *improve your* products. Marvinol can create hundreds of things—film, sheeting, sponging, or rigid—better and more economically.

And in Naugatuck Chemical, you have a reliable, *basic* source of raw materials that's in business to stay. Write us on your company letterhead today.

**Made by The Sponge Rubber Products Company, Shelton, Connecticut.*

Naugatuck Chemical **Division of UNITED STATES RUBBER COMPANY**

206 ELM ST., NAUGATUCK, CONNECTICUT

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York • Philadelphia • **In Canada:** Naugatuck Chemicals, Elmira, Ontario

MARVINOL vinyl resins • KRALASTIC styrene copolymers • VIBRIN polyester resins

outstanding

for dependable quality and uniformity

PICCO

SOLVENTS AND SOLVENT OILS

Hi-Solv Aromatic Petroleum Naphthas
PICCO Coal Tar Naphthas
Hi-Solv Heavy Naphthas
PICCO Coal Tar Heavy Naphthas
Hi-Solv Solvent Oils · PICCO Heavy Oils

Write for factual bulletin describing Picco Solvents and Solvent Oils. We will gladly send samples. Specify application, so we can furnish suitable grade.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.
Clairton, Pennsylvania
Plants at CLAIRTON, PA., WEST ELIZABETH, PA.; and CHESTER, PA.
Representatives in Principal Cities

TABLE I

ESTIMATED MAJOR EMULSIFIER MARKETS[1]

(Annual Rate)

1951

Emulsifier	Syn. Rubber & Resin Polymerization	Food	Polishes	Cutting Oils	Cosmetics, Toiletries, and Pharmaceuticals	Dry Cleaning Soaps	Textile and Leather	Insecticides	Other	TOTAL (millions of lbs)	AVERAGE PRICE RANGE ¢/lb
TOTAL CONSUMPTION (millions of lbs)	120	80	35	25	10	8	7	6	9	300	
SOAPS										168	
Sodium	XX		X	X	XX	XX	X		X	60	15–20
Rosin	XX		X	XX		XX	X		X	58	10–12
Amines	X		XX	X	XX	XX	X		X	24	40–90
Potassium	XX		X	X	XX	X	X		X	12	30–60
Ammonium			XX		X	X	X		X	14	15–18
FATTY ACID ESTERS[2]										(92)	
Glycerine		XX	X	X	XX	X	X		X	62	35–50
Polyoxyethylene	X	XX	X	X	X	X	X	XX	X	18	40–60
Sorbitol	X	XX	X	X	X	X		XX	X	9	40–60
Glycol – ethylene, diethylene, propylene		X	X	X	XX	X	X	X	X	3	30–45
SULFONATED OILS										(35)	
Petroleum	X		X	XX	X	XX	XX	X	X	19	17–35
Animal	X			XX			XX		X	9	17–35
Vegetable	X		X	X	X	XX	XX	X	X	4	17–35
Marine	X			X			X		X	2	17–35
Tall oil	X			X		X	X	X	X	1	17–35
OTHER										(5)	
Amides – sulfonated and nonsulfonated	X		X	X	X	X	X	X	X	2	30–40
Lecithin		X			X		X	X	X	2	10–20
Sulfonated lignin			X					X	X		–
Acylated polypeptides					X			X	Y		–
Pentaerythritol esters			X		X					1	90
Others											–

1. XX-major emulsifiers used in each field; X-used, but in quantities of less than 1 million pounds per year.
2. Includes a small amount of sulfated esters; esters in order of importance are stearates, oleates, laurates, and ricinoleates.

Emulsifier Trend: Sharply Up

Eight chemical processing industries will consume $85 million worth of emulsifiers this year.

Over fifty producers supply several hundred products of various chemical types under many trade names.

Competitive selling marks the field, for supply usually exceeds demand. End uses are countless, often based on zealously guarded empirical data.

J. P. Sanderson and F. K. Abel*

Chemical processing industries soak up emulsifiers like a blotter absorbs drops of ink. And it is almost as hard to trace the pattern of emulsifier production and consumption as it is to find a meaningful form in an inky blur.

There are many reasons for this: There is no exact definition of the term emulsifier. Large quantities of emulsifiers are formed *in situ*. Much production is consumed by producers. Competitive secrecy on the parts of both producers and consumers as well as the multiplicity of end uses make precise analysis difficult. For the most part, statistics reported for emulsifiers by the U. S. Tariff Commission in *Synthetic Organic Chemicals* are inadequate or deceptive.*

Anything better than a rough estimate, then, cannot be claimed for the figure of 300 million pounds annual consumption of emulsifiers given in Table 1. It is, however, based on a barkground of knowledge of the major consuming industries and interviews with producers and leading consumers. Included in it are estimates for emulsifiers formed *in situ* and those produced for captive consumption. The individual estimates from which this total was derived similarly can give only a rough measure of the relative importance of different outlets for different kinds of emulsifiers.

But the pattern is clear. Emulsifiers

*Arthur D. Little, Inc., Cambridge, Massachusetts.

* Production and sales for polyethylene glycol mono-oleate, for example, were given under three different categories in 1949. With some chemicals, e.g. sorbitol derivatives, statistics are combined to avoid revealing one company's operations. Production figures for glyceryl monostearate, listed as a plasticizer, are not clear since the list of producers excludes the major factors—P. & G., Swift and Colgate which produce edible esters principally for captive consumption. A large portion of petroleum sulfonate production, used by major petroleum companies in making cutting oils, is also captive.

are vital in the operations of a wide variety of chemical processing industries, there being eight separate consuming categories with a demand in excess of 6 million pounds per year. Each consuming entity varies from another in the type of emulsifiers it requires. And to supply these special requirements, chemical producers have developed a broad range of products. (See table of major trade-named products.)

What is an Emulsifier? In this characterization of the industry, an emulsifier is considered to be any agent which promotes the mixing of two "immiscible" liquids and contributes to the stability and consistency of such a combination. In a sense, detergency depends upon emulsification of dirt in water, but the bulk of surface-active agents used as cleansing agents —in 1950, over 2 billion pounds of soap and about 400 million pounds of synthetic detergents (100% active basis)—has been excluded. (Good detergents are generally only mediocre emulsifiers and vice versa.)

Many natural gums, seaweed extracts, water-soluble cellulose derivatives and some proteins are sometimes referred to as emulsifiers. They swell in water, often acting as stabilizers, and here their action is similar in effect, but different in mechanism to emulsification. These agents also have been omitted.

Many emulsifiers may exhibit additional characteristics such as wetting, detergency, lubrication, anti-foaming or thickening that make their selection desirable for particular uses. This discussion, however, is limited to applications where emulsification is the primary function, even though a product qualifying for such a classification in one consuming field may be used chiefly for one of its other properties elsewhere.

Table II

Synthetic Rubber Production

	Long Tons	
	1950	1951 Estimated
GR-S	351,000	680,000
Neoprene	50,000	68,000
Butyl	61,000	80,000
Buna N	12,000	16,000

Chemical Types: All surface-active agents include a water-soluble portion consisting of free hydroxyl, sulfonate, sulfate or amine groups; ether linkages; sodium or potassium, or combinations of these. For the oil-soluble portion, smulsifiers depend to a considerable extent on long chain aliphatics rather than the aromatics, typical of most synthetic detergents. Petroleum aliphatics and fatty acids derived from animal, vegetable, and marine oils—stearic, oleic, lauric, and ricinoleic acids—account for the bulk of emulsifiers. Sodium soap continues to be an important emulsifier, despite encroachment of the many newer emulsifiers which offer many possible combinations of oil-soluble and water-soluble compounds, and thus have the advantage of greater versatility and solubility.

For both economic and technical reasons these synthetic emulsifiers are rarely pure chemical compounds. The composition of the fatty acids varies, depending on agricultural and processing factors; petroleum aliphatics and ethylent exide polymers are mixtures of various chain lengths with only an average molecular weight; and the reactions—esterification is one—by which emulsifiers are made, usually yield a certain proportion of mixed products.

These same impurities, however, frequently serve to make the particular emulsifier more effective. Blends of two or more emulsifiers, combinations of mono- and di-esters, the addition of excess fatty acids or use of mixed fatty acids, and/or inclusion of modifying agents in the form of soaps, synthetic anionic or cationic surface-active agents, are deliberate and frequent methods to improve the efficacy of emulsifiers.

To a considerable degree, amine soaps have replaced regular soaps as emulsifiers since they have the advantage of much lower alkalinity, greater stability on aging, and the like. Complicating any estimate of the magnitude of emulsifier use is the fact that amine soaps are rarely sold as such, but are generally formed during the emulsification process by dissolving the particular amine in the water phase, while a fatty acid, such as oleic acid, will be incorporated in the oil phase. The formation of the amine oleate salt on mixing causes an intimate stable mixture of the two immiscible liquids.

Since many emulsifiers are composites of anionic and non-ionic compounds, classification as such would not be as significant as it is for synthetic detergents. Cationic detergents have a fairly limited market due to inherent high cost, and are rarely used solely for emulsification purposes.

MAJOR MARKETS

POLYMERIZATION

Manufacture of synthetic rubber and resins by emulsion polymerization represents an entirely new area of application for emulsifiers which has developed rapidly during the past 10 years. In the case of GR-S rubber, for example, forming a water emulsion of the liquid monomers, butadiene and styrene, greatly accelerates and facilitates polymerization.

Principal products employed in the emulsification of synthetic rubber monomers are the metallic soaps of hydrogenated tallow, grease or fish oil, and potassium and sodium soaps of rosin acid. The rosin acid soaps have come into use more recently than tallow soaps, but at the present time the two are believed to be employed in approximately equal quantities.

Emulsion polymerization of synthetic rubber has come to represent one of the most important outlets for industrial soaps. Demand for these soaps will be greatly accelerated this year as a result of increases in output of synthetic rubber (Table II).

The industry is rapidly increasing GR-S rubber porduction and expects by June of this year to have reached an annual rate of 750,000 long tons. As indicated in Table II, for the year 1951 total GR-S production will probably amount to about 680,000 long tons, which might require close to 115 million pounds of industrial soap emulsifiers. Whether this high rate of production will continue into 1952 will depend largely upon the status of the defense program. Short of a total war, it is possible that synthetic rubber production might again be cut back, causing a corresponding decline in demand for industrial soaps.

GR-S rubber consumes the bulk of the emulsifiers used in rubber polymerization, but neoprene and other modifications of elastomers also employ some emulsifiers. Emulsifier requirements for these synthetic elastomers may add another 3-4 million pounds to the total consumption of emulsifiers by the rubber industry this year. Some of the rubber manufac-

tures produce their own soaps *in situ* by addition of suitable alkali, and thus the high level of consumption is not representative for the total market for prepared emulsifiers.

Emulsifiers are also finding increasing application in the analogous polymerization of vinyl acetate, vinyl chloride, styrene and acrylic resins. Accurate estimates of consumption in the resin field are difficult. In many instances, improved resin performance is the direct result of the use of a specific emulsifier in the polymerization process. Manufacturers are thus reluctant to reveal the type of emulsifier they use.

Compared to the rubber industry, resin polymerization consumes only smal amounts of emulsifier—a few million pounds annually at the present time. Various emulsifiers have been used, as indicated by the voluminous literature on experimental resin polymerization tests. Probably the more important ones now employed include mahogany soaps—i.e., sodium salt of a complex, crude mixture of sulfonic acids from petroleum refining sludge—sorbitan oleates and laureates, polyoxyethylene esters, and some highly refined saponified fatty acids, particularly stearic acid. Technical prog-

Table III

Estimated Consumption of Edible Emulsifiers in 1950

	(millions of pounds)			
	Glyceryl mono-stearate[1]	Polyoxyethylene stearate	Others[2]	Total
Shortening				(37)
Household (650)[3]	25	small	neg'l	25
Bulk[4] (160)[3]	10	"	2	12
Bread, Rolls	17	13	1	31
Margarine	2	neg'l	2	4
Ice Cream	1	0.5	1	2.5
Chewing Gum	1	small	small	1.5
Peanut Butter	1	neg'l	neg'l	1
Yeast	0.5	neg'l	neg'l	0.5
Candy and Other	1.5	neg'l	1	2.5
Total	59	14	7	80

small – less than 500,000 pounds; neg'l – less than 100,000 pounds

1. Includes also glyceryl diacetyl tartrate monostearate, glyceryl oleo-stearate, and similar glyceryl mono- and di-stearates.
2. Includes various hexitol polyglycol fatty acid esters (Spans, Tweens) and others, lecithin (only as emulsifier and not for its major application as an "extender" for cocoa butter in manufacture of chocolate candies), and others.
3. Consumption of shortening in millions of pounds.
4. Includes shortening consumed mostly for cake baking and also that used in retail cake mixes.

ress in the booming resin emulsion polymerization field is rapid, and it is difficult to predict which emulsifiers will ultimately become most important.

FOOD USES

Food applications represent a major portion of the current and potential market for emulsifying agents, as shown in Tables I and III. The principal emulsifiers consumed here are stearic acid esters of glycerine, ethylene oxide or sorbitol. Propylene glycol esters and lecithin also find special applications.

Edible emulsifiers have three desirable effects which are responsible for their extensive use with, or incorporation in, shortening: They make possible the incorporation of appreciably larger amounts of sugar in cakes; they enhance the distribution of shortening in a baked product and thus help to prolong keeping quality; and they promote smoother, more homogeneous products.

About fifteen years ago, Procter & Gamble introduced a so-called high ratio, or emulsifying, shortening. Incorporating about 6% of a mixture of mono- and diglyceryl stearates (glycerides) produced a shortening which allows a much higher sugar-to-flour ratio than had previously been possible in cake baking. The lighter texture, improved keeping quality, and possible economic advantages won the universal acceptance of commercial cake bakers. Likewise, glyceride emulsifiers proved to be important factors in the successful sales of hydrogenated vegetable shortening, such as Crisco and Spry, in competition with lard for home use.

Domestic shortening consumption is in the order of 1.5 billion pounds, of which slightly over half is understood to contain 4%-8% of the glycerides. Probably four-fifths of this emulsifying shortening is sold for household use; the remainder, comprising bulk high-ratio shortening (Sweetex, Covo) goes to commercial outlets, principally for cake.

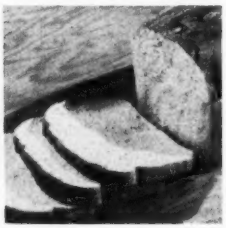
Interesting experimental results are reported when the polyoxyethylene stearates and other newer emulsifiers are substituted for glycerides in shortening products. As yet, none of these products have become commercially important.

Shortening does not strictly represent an outlet for emulsifiers since the mixture of mono- and diglycerides is formed *in situ* by the addition of the proper amount of glycerine to the vegetable or animal fat. The fat, which is largely a glyceryl tristearate, reacts with glycerine to give the desired amount of emulsifier content. For this reason, high-ratio shortening is frequently referred to by the industry as superglycerinated fat.

Bread Softeners: About five years ago, it was discovered that the glyceride emulsifiers would prolong the softness of baked goods, particularly white bread. Somewhat larger amounts were required than would be supplied by the usual high-ratio cake shortening, so bakers began to buy the emulsifier as an additive, using about ½-1 pound per 100 pounds of flour along with about 1–4 pounds of shortening. The exact function of the emulsifier is somewhat controversial, but two possible explanations are gen-

erally given: It forms a more effective barrier to the loss of moisture by better distributing the shortening, and it retards swelling of the starch granule during baking. In any event, relative crumb compressibility—i.e., squeezability—which is the housewife's criterion of freshness, was improved.

The glyceride emulsifiers, which are sold directly to the baker or bakery supply houses, are usually specified to contain about 45% glyceryl monostearate. Most of the remainder is glyceryl di-stearate which also has emulsifying action. Low free fatty acid content, good color, and bland flavor are common industry specifications too.



A difficulty in using glycerides—the necessity of dispersing them in hot water before adding to the dough or sponge—was overcome with the introduction of polyvoxyethylene stearates. Various sorbitol esters, which may or may not be solubilized with ethylene oxide, are also used by the baking industry, but on a smaller scale. Pending legal actions concerning acceptance of these newer emulsifiers by the Food and Drug Administration has retarded sales; most large chain bakers continue to use the glycerides, which are accepted.

The fact that a quarter pound of polyoxyethylene stearate has been reported to be equivalent in its action to a half pound of the glycerides per 100 pounds of flour suggests a shift to this type of emulsifier if these ethylene oxide types are ultimately accepted as a standard ingredient in bread by the FDA. However, the present FDA standard for bread does not include them. If this standard is upheld on appeal, the emulsifiers will not be permitted in bread shipped in interstate commerce.

Reduction of the melting point of glyceride emulsifiers through use of lard fatty acids—to make so-called glyceryl oleo-stearate emulsifier—has improved their position in recent years. A special shortening, such as Swift's Trico, containing about 20% glycerides, is preferred by many commercial bakers since it overcomes the difficulty of incorporating the emulsifier separately. P & G's recent action in making its patents on the production and use of high-ratio shortening available may stimulate further the application of glyceride emulsifiers in bakery products. Potentially, there is a market for 50 million pounds of glycerides, or 25 million pounds of polyoxyethylene stearate, in bread.

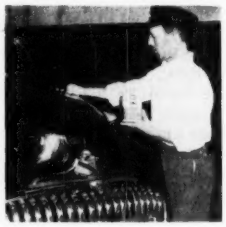
Lecithin was widely used in the baking industry up to ten to fifteen years ago, but improvements in milling of flour obviate the need for lecithin, although some bakery supply houses use it in their prepared shortening compounds containing auxiliary baking ingredients. It is questionable to what extent lecithin functions here as an emulsifier. Certainly its effect as a softening agent was less pronounced than the fatty acid esters now being used.

Minor Outlets: All other food applications for the edible emulsifiers account for a much smaller consumption. Although these food uses are technically interesting, development of markets of the size provided by shortening and baked goods appears unlikely. The use of an emulsifier in conjunction with a stabilizer—alginates, carboxymethyl cellulose, Irish moss, or vegetable gums—in ice cream to impart a smooth texture is well established. The size of this market is limited by the very small amounts of fatty acid ester emulsifier required, plus the continued use of egg yolk emulsifier by some ice cream producers. Polyoxyethylene, glyceryl and sorbitol stearates also predominate as ice cream emulsifiers.

Emulsifiers frequently contribute additional advantages which account for increasing consumption of the edible grades in the following applications: as lubricants in chewing gum, as anti-spattering agents to enhance the cooking properties of margarine (sodium glyceryl stearyl sulfoacetate is important here), and as anti-hygroscopicity agents in yeast. In chocolate candy, for example, the fatty acid ester not only serves to improve chewiness as a lubricant, but as an emulsifier appears to reduce tendency toward blooming. (Blooming refers to a mottled surface, which may be due in part to crystallization of certain fatty fractions of the cocoa butter.) The major application for lecithin is in chocolate candy, but since it functions more to control the fluidity of the cocoa butter, it is not classified as an emulsifier in this application.

POLISHES

The introduction, over fifteen years ago, of self-polishing floor polish—a dispersion of fine wax particles in water or in an oil-in-water emulsion—opened a large and growing market



for emulsifying agents. Over 200 million pounds (as bought by the consumer) of floor wax preparations are consumed annually; about 80% of this amount is the self-polishing type. This is in addition to shoe, automotive, furniture, and metal polishes, which make a combined total almost equal to the water emulsion types. Most furniture polishes are water emulsions of mineral oil, linseed oil and/or castor oil.

Ammonium and amine fatty acid soaps dominate the self-polishing floor waxes, since they evaporate with the water to leave a dry wax film more impervious to water than the film formed when a non-volatile emulsifier is employed. Morpholine, a cyclic amine ether, marketed by Carbide and Carbon, finds extensive application in wax emulsions because it evaporates at the same rate as water.

Alkali is usually incorporated to aid in the saponification of carnauba wax polishes, and because of the excess fatty acid—usually tallow-derived oleic—which is present, any estimate of the emulsifier formed *in situ* is difficult. (As a rule, the emulsifier also contributes to cleansing properties.) Exclusive, in this case, of the sodium soap present, it is estimated that 20

million pounds of amine soaps (requiring 7 million pounds of organic amines), 13 million pounds of ammonium soaps and 2 million pounds of various fatty acid esters are consumed annually by the wide range of wax polishes now on the market.

CUTTING OILS

The so-called soluble oils are employed in all metal cutting and grinding operations where cooling is the dominant factor affecting production rate and tool life, but where high degree of lubrication is not as important. The term "soluble oils" is technically incorrect as most of these oils actually form an emulsion with water rather than a true solution. Consumption of these fluids is already large and will most likely increase because of more rapid methods of machining and the greater accuracy achieved by this method of lubricating the working surface. Approximately 20 million

gallons, equivalent to 160 million pounds of soluble cutting fluid, may be consumed annually at the present time, requiring close to 25 million pounds of emulsifier. In general, the emulsifier represents 12-15% by weight of a soluble cutting oil base. In the case of the translucent soluble oils, which permit the metal worker to observe his work, considerably more emulsifier may be required.

Most cutting fluids contain more than one emulsifier, but by far the larger demand is for potassium and sodium petroleum sulfonates as the primary emulsifying agent. Many of the larger oil companies produce petroleum sulfonates for use within their own organizations, and production of material employed in this way is, therefore, not reported. In addition, petroleum companies may form their primary sulfonated base emulsifier *in situ* by treating the oil already containing sulfonates with acid and further adding whatever emulsifier is needed to produce the required level of emulsion stability.

In recent years, petroleum sulfonates have been in greater demand for the manufacture of synthetic detergents and as detergent additives for motor oils. This has resulted in a corresponding increase in cost of petroleum sulfonates for cutting oil purposes, so that there is an interest in the development of a new type of emulsifier in a lower price range than that of petroleum sulfonate.

A good emulsifier for cutting oils should be fairly oil-soluble and have good suspending action, and give no curd formation or reaction with hard water. Cutting oil manufacturers, there, therefore employed supplementary oil-soluble products as emulsifiers in conjunction with the primary petroleum sulfonates. Most soluble oils contain in addition to emulsifiers, various products which contribute to rust inhibition, bactericidal and extreme pressure characteristics. It is not known whether the additives actually function as assistants to formation of the emulsion however.

The sodium and potassium rosin soaps, amine soaps of rosin acids and various fatty acids are often employed alone or in conjunction with the sulfonates. Soaps based on lanolin or wool grease and tall oil soaps are also employed to a limited extent, and the amine soaps have been used in manufacture of some of the translucent cutting oil bases.

PHARMACEUTICALS

The actual consumption of prepared emulsifiers in cosmetic, toiletry and pharmaceutical products is small—probably about 2 million pounds per year. The amine, sodium and potassium soaps formed in the preparation of various products, however, brings the total emulsifier consumption close to 10 million pounds per year. Borax-beeswax emulsions, which form the base of most cold creams and cleansing creams, would also augment the total. Natural gums, which are the thickening agents for the bulk of hand lotions sold, are excluded.

An emulsifier usually adds aesthetic values by blending water and oil-based ingredients into an homogeneous product. Lubrication, cleansing, or wetting action may be additional attributes. Lotions, creams, and ointments for topical application are the chief products in which emulsifiers are used although elixirs and special parenteral liquids also employ them to a certain extent.

In both the cosmetic and pharmaceutical products, emulsifiers must be of a pure, non-toxic, non-irritating, and non-sensitizing nature, and should have little odor, color or taste. None of the products now on the market is considered ideal. Emulsifiers with

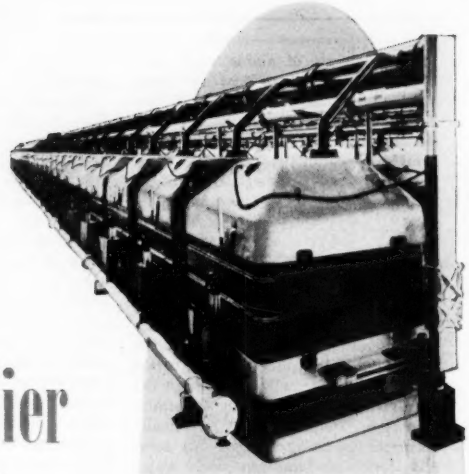
blander taste, better stability, and more uniform physical characteristics, and availability of a wider selection of proven non-toxic emulsifiers would be welcomed. There is a trend toward greater use of synthetic products, especially the fatty acid esters.

DRY CLEANING

About two dozen manufacturers share the $50 million per year dry cleaning soap business, and most of these are aggressive in sales, but short on technical development. Emulsifiers have the dual function of water-in-oil emulsifiers and grease solvents, aid in spotting of garments prior to immersion in dry cleaning solvents. Competition and poor understanding of the requirements of the field have limited the application of the new synthetic emulsifiers, but there is believed to be a trend in that direction. Sulfonated petroleum products, amine and alkali soaps are now dominant.

Although the increased use of wet-process dry cleaning creates a need for dry cleaning soaps, the difficulty in removing them from the solvent by filtration after they have emulsified the water-soluble dirt, hinders the use of an efficient emulsifier. Fatty acid esters also have an inherent disadvantage of high softening points, causing separation below 10 C.

Hooker Chemicals stem from the Type "S" Cells at Niagara Falls and the high-capacity Type "S-3" Cells at Tacoma. In these cells, the highly efficient electrolysis of salt brine produces raw materials of high purity and constant uniformity, in quantity, for use by more than 30 U.S. industries.



HOOKER - basic supplier of INTERMEDIATES . . . . . .

- Benzal Chloride
- Benzoic Acid
- Benzotrichloride
- Benzoyl Chloride
- Benzyl Chloride
- Chlorobenzenes
- Chlorotoluene
- Lauryl Chloride
- Monochloroacetic Acid
- m-Nitrobenzoyl Chloride
- p-Nitrobenzoyl Chloride
- Phenyl Isocyanate
- Sodium Benzoate
- Sodium Sulfhydrate
- Thionyl Chloride

These Hooker Chemicals are widely used as intermediates by many process industries.

Starting point for all Hooker intermediates is the highly efficient Type "S" Cell. Used by Hooker and by many licensees, the "S" Cell has increased the domestic production and commercial supply of these and other chemicals.

Hooker serves you with strategically located plants and distributing stations; careful control of shipments; skilled customer service. This well-balanced supply "package" has pleased many users.

For the complete list of Hooker Chemicals, send for Bulletin 100. For properties, specifications and uses of any chemicals listed here, ask for Technical Data Sheets. Please request them on your business letterhead.

A WORD ABOUT DELIVERIES—Production of Hooker Chemicals is at an all-time peak, and plant facilities are being expanded to meet your needs as promptly as possible. For up-to-date delivery information, we suggest that you keep in touch with your Hooker sales representative.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

3 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.

New York, New York • Wilmington, California • Tacoma, Washington

HOOKER CHEMICALS

1-516

ALUMINUM CHLORIDE, ANHYD. • CAUSTIC SODA • CHLORINE • MURIATIC ACID • SODIUM SULFIDE • SULFUR CHLORIDES • SULFURYL CHLORIDE

TEXTILES, LEATHER

Various textile-treating agents, including penetrants, dye assistants and dyestuffs, are applied in the form of emulsions. Almost all of the classifications of emulsifiers shown in Table I are employed. The bulk of surface-active agents consumed in both textile and leather, however, is for wetting and/or detergency.

Total consumption of emulsifiers by the textile industry is about 4 million pounds. Sulfonated oils dominate the field.

Textile machinery lubricants and rayon, cotton and wool lubricating compounds are soluble or emulsified oils, with amine or sodium soaps as emulsifiers. An emulsified oil is desired in this instance because such oil spots are easily removed from fabric or yarn in the regular scouring operation. Combing and drawing operations in the textile field require a minimum of friction between fibers and machine parts, and an emulsion based on vegetable oils or mineral oils is employed in this type of operation.

Solvent emulsions of ethylene dichloride, naphtha, dichlorethyl ether and kerosene, all based on amine soaps, serve the textile industry in scouring and wetting-out operations. Another use for emulsifiers is in textile finishes, which are often applied from an emulsion carrier.

In the leather industry, the uses for emulsifiers are similar to those of the textile industry, since in many instances the principal requirement is for a wetting or penetrating agent. Emulsified oils are employed, however, in "fat liquoring"—the treatment of leather with a nourishing and lubricating oil for improving its strength, flexibility and finish following tanning.

Sulfonated cod, castor, sperm, olive, pine, menhaden and neatsfoot oils are usually employed with some mineral oil in the form of water emulsions. A wide range of sodium, potassium, ammonium and amine soaps, as well as the rosin acid soaps, sulfonated oils, polyoxyethylene and glyceryl fatty acid esters, are employed as emulsifiers not only in the fat liquoring bath, but as assistants in the application of special finishing materials and as suspending agents for pigments in leather dyeing.

INSECTICIDES

A new need for emulsifiers was created by the promotion of insecticide sprays and wettable powders for agri-

MAJOR MANUFACTURERS OF COMMERCIAL EMULSIFIERS

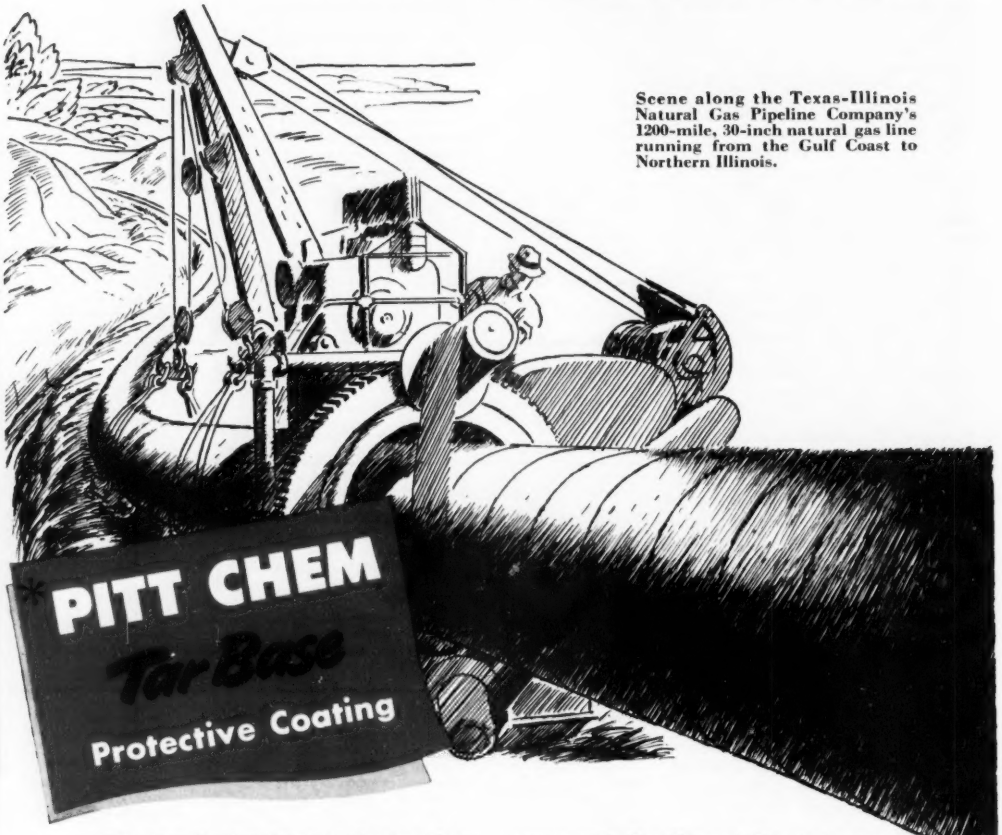
Trade Name	Type	Company
Alcolec	Lecithin	American Lecithin
Aldo 25	Propylene glycol monostearate	Glyco Products
Aldo 28, 33	Glyceryl monostearate	Glyco Products
Aldo 40	Glyceryl oleo-stearate	Glyco Products
Alfracals	Sulfonated petroleum aliphatics	Alframing Corp.
Aliphatic ester sulphates		Onyx Oil & Chem.
Alrodynes	Polyoxyethylene fatty acid esters	Alrose Chemical
Alromulsols	Polyoxyethylene fatty acid esters	Alrose Chemical
Alrosols	Non-sulfonated amides	Alrose Chemical
Amine Soaps		The Beacon Co.
Antara 400 Series	Polyoxyethylene alkyl phenol ether	Antara Products
Antarox A-200	Polyoxyethylene alkyl phenol ether	Antara Products
Antarox B-100	Polyoxyethylene fatty acid ester	Antara Products
Antarox B-201, B-209	Polyoxyethylene vegetable oil ester	Antara Products
Antarox D-100	Polyoxyethylene fatty alcohol ether	Antara Products
Antaron R-115	Alkyl aryl sulfonate—proteinaceous blend	Antara Products
Antaron S-140	Sulfated castor oil	Antara Products
Antarane U-490	Compounded mixture	Antara Products
Apasol W-1345	Sulphonated ester	Jacques Wolf
Arlacel Series	Sorbitol fatty acid esters	Atlas Powder
Atlox Series	Polyoxyethylene sorbitol esters of mixed fatty acids	Atlas Powder
Atmul Series	Edible glyceryl fatty acid esters	Atlas Powder
Avasols	Non-sulfonated amides	Alframing Corp.
Azocel	Polyoxyethylene fatty acid esters	Synthetic Chemicals
Base 401 M, 501 M	Non-ionic sulfonated blend	E. F. Drew
Base Oil S-340 A	Amine soap	Jacques Wolf
Betramine	Sulfonated amide	Alframing Corp.
Blendene	Not revealed	Glyco Products
Brij Series	Polyoxyethylene fatty alcohol derivatives	Atlas Powder
Carbowax Ester Series	High molecular weight polyoxyethylene fatty acid esters	Glyco Products
Carchem Base 11, 600	Blended petroleum sulfonates	Carlisle Chemical
Castorol	Sulfonated oil	Ottol Oil
Centrol Lecithin	Lecithin	Central Soya
Cerasynt	Glyceryl and glycol fatty acid esters	Van Dyk
Chlorosol	Non-ionic sulfonated blend	E. F. Drew
Codol	Sulfonated oil	Ottol Oil
Corasfl	Sulfonated vegetable oil	E. F. Drew
Coronyl	Sulfonated vegetable oil	E. F. Drew
CPH	Fatty acid ester of glycerine, glycols, and polyoxyethylene	C. P. Hall
Detergent O-245	Non-sulfonated amide	Jacques Wolf
Detergent W-1653	Non-sulfonated amide	Jacques Wolf
Demol 14	Polyglyceryl fatty acid ester	Emulsol Corp.
Dianol ANC	Sulfonated petroleum aliphatic	Quaker Chem. Products
Dianol G	Non-sulfonated amide	Quaker Chem. Products
Diethanol Stearamide	Non-sulfonated amide	Atlantic Chem.
Dresinates	Rosin soaps	Hercules Powder
Drisyn	Non-sulfonated amide	E. F. Drew
Drocosol	Sulfonated vegetable oil	E. F. Drew
Druflake	Sodium soap	E. F. Drew
Druso	Potash vegetable soap	E. F. Drew
Emargol	Sodium sulfoacetatyl glyceryl stearate	Emulsol
Emcol H-30	Polyoxyethylene fatty acid esters	Emulsol
Emcol IM	Isopropyl alcohol esters	Emulsol
Emcols MM, 61, 62, 63	Non-sulfonated amides	Emulsol
Emcols MS, MST, RNT, RGL, CA	Fatty acid esters	Emulsol
Emcols 14, 18, SPN, HCP No. 6	Polyglyceryl fatty esters	Emulsol

Emulsifiers:

* Emulsifiers are listed alphabetically according to tradename since most products on the market are sold under a particular company designation. Where a product has no tradename it is listed alphabetically in the tradename column under its chemical name. Hence, it should be noted that although an emulsifier may be listed by its chemical name and a manufacturer cited, the same chemical may be available from another maker under his tradename. A check of the chemical type column will show such producers.

*Life-Saving "Skin"**

for another **BIG INCH** pipeline



Scene along the Texas-Illinois Natural Gas Pipeline Company's 1200-mile, 30-inch natural gas line running from the Gulf Coast to Northern Illinois.

Pitt Chem Tar Base Protective Coating is being applied to nearly half the length of the new steel pipeline that will soon carry gas from the Corpus Christi area to Joliet, Ill. It's one of the basic materials of a tough, metal-preserving sheath that will guard against underground corrosion and add years of life to the vital line.

This reinforced tar base coating provides more than just "life insurance" for this $120,000,000 transportation system. Because of its unvarying top quality—maintained by painstaking laboratory control—Pitt Chem pipeline coating performs better on application, serves better and longer underground.

This same *quality-assurance* is an important advantage when you use *any* of Industry's Most Comprehensive Family of Protective Coatings . . . whether it's a Pitt Chem Alkyd, Chlorinated Rubber, Vinyl or Phenolic base coating. ● For more information about these versatile equipment-savers, send for booklet, "Control Corrosion Through Pitt Chem Protective Coatings."

Protective Coatings Division

PITTSBURGH COKE & CHEMICAL CO.

GRANT BUILDING PITTSBURGH 19, PA.

W&D 3591C

OFFICES: NEW YORK • CHICAGO • ST. LOUIS • TULSA • HOUSTON • LOS ANGELES • SAN FRANCISCO

cultural application. Solvents produced by petroleum companies specifically for use with such synthetic insecticides as DDT, benzene hexachloride, and chlordane, require special emulsifiers. These are frequently combinations of two or more chemically different emulsifiers; hence, classifying them is difficult. Leading trade name insecticide emulsifiers are the series of Atlas Powder and the Triton X series of Rohm & Haas.

The function of the emulsifier is two-fold: It allows dilution of the insecticide-solvent mixture with water, thus cutting the cost of application; and it also imparts wetting action to improve the efficacy of the spray. Wettable powders, usually requiring a stabilizing carrier such as bentonite, are also sprayed as water dispersions, but emulsifiers are less vital in their formulation. Currently the two types of formulations are of about equal importance.

Probably 6 million pounds of emulsifiers are now being consumed annually for insecticide use, mostly in sprays; further growth is anticipated.

OTHER MARKETS

Various emulsifying agents for myriad processing uses, as well as for improving the saleability of diverse consumer products, may be more important than is indicated by the 14 million pounds allocated to "others" in Table I. But several apparently large emulsion applications offer only limited outlets for commercial emulsifiers. Representative examples are asphalt emulsions and water-emulsion paints which depend to a greater extent on stabilizers, previously differenciated from emulsifiers.

Bentonite, cottonseed meal, casein, lignin, and even blood are used with asphalt to stabilize the water emulsion; to control the breaking point or rate of water evaporation of the emulsion; and to facilitate mixing with aggregates such as sand, crushed stone or cement. Soaps, particularly the

Trade Name	Type	Company
Emcols 4150, X-25	Sulfocolaurate amide	Emulsol
Emery No. 2221	Glyceryl mono-oleate	Emery Industries
Emulphogene MO	Petroleum sulfonate blend	Antara Products
Emulphor AG oil-soluble	Polyoxyethylene fatty acid ester	Antara Products
Emulphor EC, BLA	Polyoxyethylene vegetable oil esters	Antara Products
Emulphor K	Compounded mixture	Antara Products
Emulphor ON	Polyoxyethylene fatty alcohol ether	Antara Products
Emulsifier 803 M	Non-ionic sulfonated blend	E. F. Drew
Esterine	Glyceryl monostearate	Swift & Co.
Ethanolamine coconut oil soaps		Atlantic Chem.
Ethofats	Polyoxyethylene fatty acid esters	Armour & Co.
Ethomeens	Polyoxyethylene fatty amines	Armour & Co.
Ethomids	Non-sulfonated amides	Armour & Co.
Fatty Acid Esters		The Beacon Co
Fatty Acid Esters of Ethylene Glycol		Colgate-Palmolive-Peet
Fatty Acid Esters of Ethylene Glycol		Glyco
Fatty Acid Esters of Ethylene Glycol		Kessler Chemical
Fatty Acid Esters of Diethylene Glycol		Colgate-Palmolive-Peet
Fatty Acid Esters of Diethylene Glycol		Glyco
Fatty Acid Esters of Diethylene Glycol		Kessler Chemical
Fatty Acid Esters of Glycerine		Arthur C. Trask
Fatty Acid Esters of Glycols		Arthur C. Trask
Fatty Acid Esters of Propylene Glycol		Colgate-Palmolive-Peet
Fatty Acid Esters of Propylene Glycol		Kessler Chemical
Fatty Acid Esters of Pentaerythritol		Arthur C. Trask
Fatty Acid Esters of Propylene Gylcol		Glyco
Foamole	Non-sulfonated amide	Van Dyk & Co.
Foremul L-32	Polyoxyethylene fatty acid ester	Jacques Wolf
Foremul L-34	Polyoxyethylene fatty acid ester	Jacques Wolf
Foremul L-45	Polyoxyethylene fatty acid ester	Jacques Wolf
Gammanol	Sulfonated petroleum aliphatic	Griffin Chemical
G Series	Polyoxyethylene sorbitol esters of mixed fatty acids and combined blends of glycol and polyoxyethylene fatty acid esters, polyglycol aliphatic amines	Atlas Powder
G-1400 Series	Polyoxyethylene sorbitol lanolin derivatives	Atlas Powder
G-1700 Series	Polyoxyethylene sorbitol beeswax derivatives	Atlas Powder
G-917, 923, 924	Propylene glycol fatty acid esters	Atlas Powder
G-2162	Propylene glycol polyoxyethlene monosrearate	Atlas Powder
G-2800	Polyoxypropylene sorbitol mannitol dioleate	Atlas Powder
Glaurin	Diethylene glycol monolaurate	Glyco Co.
Glyceryl Diethylene Glycol Stearate		Carlisle Chemical
Glyceryl Fatty Acid Esters		Glyco Co.
Glyceryl Fatty Acid Esters		Riverdale Chemical
Glyceryl Laurate		Colgate-Palmolive-Peet
Glyceryl Monoricinoleate		Baker Castor Oil
Glyceryl Monostearate		Carlisle Chemical
Glyceryl Monostearate		Colgate-Palmolive-Peet
Glyceryl Monostearate		Kessler Chemical
Glyceryl Oleate		Colgate-Palmolive-Peet
Glyceryl Oleostearate		Carlisle Chemical
Glyceryl Propylene Glycol Stearate		Carlisle Chemical
Glyceryl Ricinoleate		Colgate-Palmolive-Peet
Glycox Series	Polyoxyethylene fatty acid ester blends	Glyco
Goremul A	Not revealed	Glyco
HALLCO	Fatty acid ester of glycerine, glycols, and polyoxyethylene	C. P. Hall
Hydrogenated Tallow		Colgate-Palmolive-Peet
Hydrogenated Vegetable Oil Monoglyceride		Colgate-Palmolive-Peet
Hydrosol, HS-1	Polyoxyethlene esters of tall oil	Thompson Horticultural Chemicals
Hygro	Glyceryl fatty acid esters	E. F. Drew

Trade Name	Type	Company
Igepal CA, CO, HC	Polyoxyethylene alkyl phenol ether	Antara Products
Intracols	Non-sulfonated fatty acid amide type	Synthetic Chemicals
Intrals	Polyoxyethlene fatty acid esters	Synthetic Chemicals
Kemulsion Bases	Not revealed	Kem Products
Kessco Emulsifier Series	Fatty acid esters	Kessler Chemical
Lanafin	Potassium soaps	Standard Chem. Products
Lecithin		A. E. Staley
Lecithin		Glidden
Lecithin		Archer-Daniels-Midland
Lecithin		General Mills
Lipals	Polyoxyethylene fatty acid esters	E. F. Drew
Lupomin	Non-sulfonated fatty acid amide	Jacques Wolf
Luxolene	Glyceryl fatty acid esters	E. F. Drew
Lux-O-San	Sulfonated ester	E. F. Drew
Mahogany Soaps	Petroleum sulfonates	Indoil Chemical
Marasperse C	Calcium lignosulfonate	Marathon Corp.
Marasperse CB	Partially desulfonated sodium lignosulfonate	Marathon Corp.
Marasperse N	Sodium lignosulfonate	Marathon Corp.
Marine & Vegetable Sulfonated Oils		Arthur C. Trask
Maypon K, 4-C	Acylated polypeptides	Maywood Chem. Works
Minrolene	Potassium soap	Ottol Oil
Monopol Brilliant Oil 40%	Sulfated castor oil	Antara Products
Monostearin	Glyceryl monostearate	Glyco
Monsanto Emulsifier H, R	Sulfonated petroleum aliphatics	Monsanto
Monsanto Emulsifier L, M	Blend anionic and non-ionic emulsifiers	Monsanto
Monoglyceride #38, #60	Glyceryl fatty acid esters	Swift & Co.
Mulsors	Ethylene glycol and polyoxyethylene fatty acid esters	Synthetic Chemicals
Myverol Series	Distilled mono- glycerides (90% mono content)	Distillation Products Industries
Neatsfootol	Sulfonated oil	Ottol Oil Co.
Nekal AEMA	Alkyl aryl sulfonate-Proetinaceous blend	Antara Products
Neopals	Polyoxyethylene fatty acid esters	E. F. Drew
Neutronyx Series	Polyoxyethylene fatty acid esters	Onyx Oil & Chemical
Ninols	Non-sulfonated amides	Ninol Laboratories
NNO	Glyceryl mannitol laurate	Atlas Powder
Nonisols	Polyoxyethlene fatty acid esters	Alrose
Nonolene Series	Glycol fatty acid esters	Ottol Oil
Nopalcol	Polyoxyethylene fatty acid esters	Nopco Chemical
Nopco Esters	Glyceryl and Glycol fatty acid esters	Nopco Chemical
Nopcogen	Non-sulfonated amides	Nopco Chemical
Nopco Soaps	Ammonium, potassium, sodium soaps	Nopco Chemical
Nopco Sulfonated Oils	Sulfonated amides, esters and animal, vegetable, marine, and tall oils	Nopco Chemical
Oleo-Stearate		Kessler Chemical
Onyxols 9162, 336	Non-sulfonated amides	Onyx Oil & Chemical
Oratoll-48	Sulfonated amide	Jacques Wolf
PD. Softener	Sulfonated neatsfoot oil	E. F. Drew
Pegesta	Polyoxyethlene fatty acid esters	Riverdale Chemical
Peigy	Polyoxyethylene fatty acid esters	Stand. Chem. Prod.
Pentamull 126	Technical pentaerythritol mono-oleate	Heyden
Petroleum Sulfonates		Socony-Vacuum
Petronate	Oil-soluble sodium petroleum sulfonates	L. Sonneborn Sons
Polyethylene Glycol Ester Series	Polyoxyethylene fatty acid esters	Kessler Chemical
Polyethylene Glycol 200 to 600 Series	Low molecular weight polyoxyethylene fatty acid esters	Glyco
Potash Rubber Soap Flakes	Potassium soap	Swift & Co.
PS-50, PL 50-3, RDED, DOS, EO-50, RHP, CAD	Ethylene, diethylene and propylene glycol fatty acid esters	Emulsol Corp.

rosin type, are used as the emulsifiers. Asphalt cut back with petroleum solvents competes with asphalt emulsions and seems to offer better growth opportunities for chemical additives. The function of cationic organic amines or ammoniated tall oil or red oil-type derivatives used here, however, is to promote adhesion of asphalt to the aggregate rather than to act as emulsifiers.

Stabilizers too, rather than emulsifiers, are required in the manufacture of cold water paints. About 10 million pounds of proteins, such as casein, corn gluten, or soy protein isolate, are consumed annually as stabilizers in water-emulsion-type paints, and to a less important extent, as pigment-binding and film-forming agents in the older type of powder and paste water paints. Some fatty acid esters, such as diethylene glycol monolaurate, are used in much smaller amounts than the stabilizer and usually for some special effect, particularly antifoaming, rather than emulsification. Any trend in this field toward synthetics will be toward such stabilizers as methyl cellulose, alginates, or starch derivatives rather than emulsifying agents.

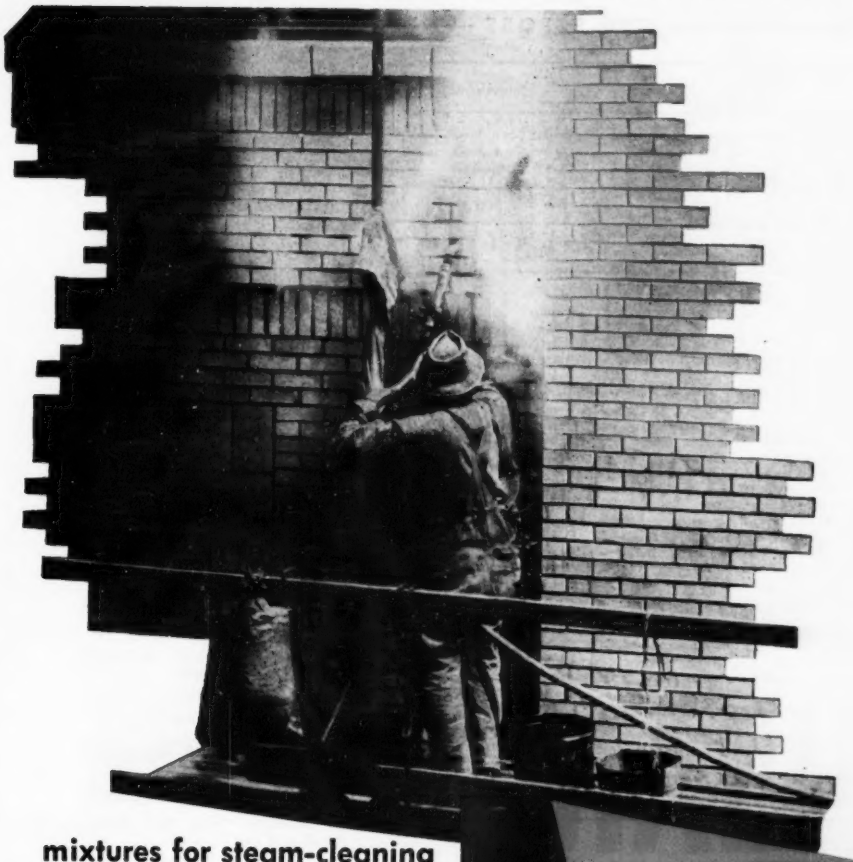
PRODUCERS

Products of all manufacturers from whom information was obtained for this survey are listed alphabetically in an accompanying table. Notably excluded from this listing are many of the major producers of petroleum sulfonates, sulfonated oils, high-ratio shortening and organic amines. Only manufacturers have been included, but in some cases virtually the entire output of a manufacturer may be distributed under another brand name not included in this list.

Important petroleum sulfonate producers include The Sun Oil Co., The Texas Co., Standard Oil of New Jersey, Standard Oil of California, and Gulf Oil Corp. as well as a great many large and small suppliers of sulfonated vegetable marine and animal oils.

The suppliers of organic amines are indirect but important contributors to the emulsifier field. The estimated annual production of 30 million pounds of ethanolamine finds an important outlet in emulsifiers which are generally formed *in situ* by the user during preparation as fatty acid soaps. Carbide accounts for a large share of the amine business; Dow also produces substantial quantities of ethanolamine; and Jefferson Chemical soon will. Sharples Chemicals produces ethyl-

even the "sidewalk superintendents" are amazed!



mixtures for steam-cleaning skyscrapers—or any other big, tough job—

work FASTER w

Nacconol

MERICA'S LEADING SYNTHETIC DETERGENT

A little NACCONOL goes a long way to make mixtures work faster and better. No other synthetic detergent does so much for so little!

NACCONOL is the "balanced detergent" with the optimum combination of wetting, washing, emulsifying and dispersing properties. Equally effective in hot, cold, hard or soft water.

Remember: America's first mass-produced low cost detergent is still "America's Leading Synthetic Detergent." For starting formulas, prices and delivery, wire or phone our nearest office.

NATIONAL ANILINE DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N.Y. • BOwling Green 9-2240

Boston 14, Mass., 150 Causeway St.	CApitol 7-9490	Richmond 19, Va., 8 North Fifth St.	Richmond 3-1930
Providence 3, R.I., 15 Westminster St.	DExter 1-3000	Columbus, Ga., Columbus Interstate Bldg.	Columbus 3-1029
Philadelphia 8, Pa., 200-204 S. Front St.	LOmbard 8-6382	Greensboro, N.C., Jefferson Standard Bldg.	Greensboro 2-2510
San Francisco 5, Cal., 517 Howard St.	SUtter 1-7507	Chattanooga 2, Tenn., James Building	Chattanooga 8-6347
Portland 9, Ore., 730 West Burnside St.	Beacon 1853	Atlanta 2, Ga., 140 Peachtree St.	CYpress 2821
Chicago 54, Ill., The Merchandise Mart	SUperior 7-3307	New Orleans 18, La., 714 Carondelet Building	Raymond 7220
Charlotte, 1 N.C., 201-203 West First St.	CHarlotte 3-9221	Toronto 2, Canada, 137-143 Wellington St. W.	Elgin 6495

Trade Name	Type	Company
Quaker -2546, 3925	Sulfonated petroleum aliphatics	Quaker Chem. Prod.
Quaker #1500 Soap	Sodium soap	Quaker Chem. Prod.
Quakester S-30	Polyoxyethylene fatty acid esters	Quaker Chem. Prod.
Quix	Sulfonated amides	E. F. Drew
Quixite	Sulfonated amides	E. F. Drew
ReNu	Rosin soap	Armour & Co.
Saponol #133, #141	Rosin soaps	Ottol Oil
Saponol #600	Potassium soap	Ottol Oil
Secal	Fatty acid ester	Emulsol Corp.
Sodium Ricinoleate		Baker Castor Oil
Solricin 1	Potassium ricinoleate soap	Baker Castor Oil
Solricin 2	Ammonium ricinoleate soap	Baker Castor Oil
Soluble Luxolene	Sulfonated ester	E. F. Drew
Soluita	Fatty acid ester	Emulsol Corp.
Sotexes	Polyoxyethylene amino fatty acid ester	Synthetic Chemicals
Span Series	Sorbitol fatty acid esters	Atlas Powder
Sperm Oils	Sulfonated marine oils	E. F. Drew
Spermol	Sulfonated Oil	Ottol Oil
Standspol	Sulfonated vegetable oil	Stand. Chem. Prod.
Sulfanole AN, ANO	Non-sulfonated amides	Warwick Chemical
Sulfanole CP	Sulfonated amides	Warwick Chemical
Sulfonated Animal & Vegetable Oils		Onyx Oil & Chem.
Sulfonated Castor Oil	Sulfonated animal, vegetable and marine oils	Swift & Co.
Sulfonated Cod	Sulfonated marine oils	E. F. Drew
Sulfonated Lecithin	Under development	American Lecithin
Sulfonated Petroleum Substituted Aromatics		Penn. Refining
Sulfonated Pure Neatsfoot Oil	Sulfonated animal, vegetable and marine oils	Swift & Co.
Sulfonated Sperm Oil	Sulfonated animal, vegetable and marine oils	Swift & Co.
Sulframin DT	Sulfonated amides	Ultra Chemical
Sulfricin	Blend of sodium glyceryl ricinoleates	Baker Castor Oil
Sulphonated Castor Oil		Jacques Wolf
Sulphonated Cod Oil L-5		Jacques Wolf
Sulphonated Olive Oil		Jacques Wolf
Sulphonated Rice Oil		Jacques Wolf
Sulphonated Sperm Oil L-68		Jacques Wolf
Syn-O-tols	Non-sulfonated amides	E. F. Drew
Synthetics B-49, C-7	Polyethylene rosin esters	Hercules Powder
Tegacid	Glyceryl monostearate	Goldschmidt Chem.
Tegin	Glyceryl monostearate	Goldschmidt Chem.
Tegin P	Propylene glycol monostearate	Goldschmidt Chem.
Tenlo-10	Fatty acid esters	Griffin Chem.
Torridex	Sulfonated animal oil	Warwick Chem.
Trem-615, 616, 014, 024	Fatty acid esters	Griffin Chem.
Triton X Series	Alkyl aryl polyether alcohols	Rohm & Haas
TSS	Triethanolamine stearate	Glyco
TT 3191, 3192, 3194, 3511, 3562	Sulfonated animal and vegetable oils	Quaker Chem. Prod.
Tween Series	Polyoxyethylene sorbitol fatty acid esters	Atlas Powder
Twitchell 8262 Base	Mixture of hydrocarbon sulfonates and additives	Emery Industries
Textile Oil 522	Sulfonated vegetable oil	E. F. Drew
Ultrapole DL, S	Non-sulfonated amides	Ultra Chemical
Victamuls	Non-ionic organic phosphates	Victor Chemical
Warco Amine 1, 2, 3	Non-sulfonated amides	Warwick Chemical
Warco A 162	Ethylene glycol fatty acid ester	Warwick Chemical
Warco A 225	Sulfonated vegetable oil	Warwick Chemical
Warcolene 945	Sulfonated vegetable oil	Warwick Chemical
Weavelok B	Rosin soap	Warwick Chemical
Wetsyn	Non-sulfonated amides	E. F. Drew
X-489-R	Polyglycol ester (monostearate)	Emery Industries
X-523-R	Polyglycol ester (mixed mono- and dioleate)	Emery Industries
X-539-R	Polyglycol ester (mono-oleate)	Emery Industries
Xynomines	Sulfonated amides	Onyx Oil & Chemical

amines which are priced at a lower level than ethanolamines, although they are somewhat more volatile. Sharples also produces relatively small quantities of ethylethanolamine and isopropylethanolamine. Commercial Solvents markets special aminohydroxynitroparaffin derivatives.

Swift is the leading supplier of glyceryl mono- and di-stearates through direct sale of the emulsifier or its special concentrated shortening, Trico, to commercial bakers; through sales of its shortening to the consumer; and through sales to the ice cream industry, either alone or combined with stabilizers such as gelatin, carboxymethyl cellulose and alginates.

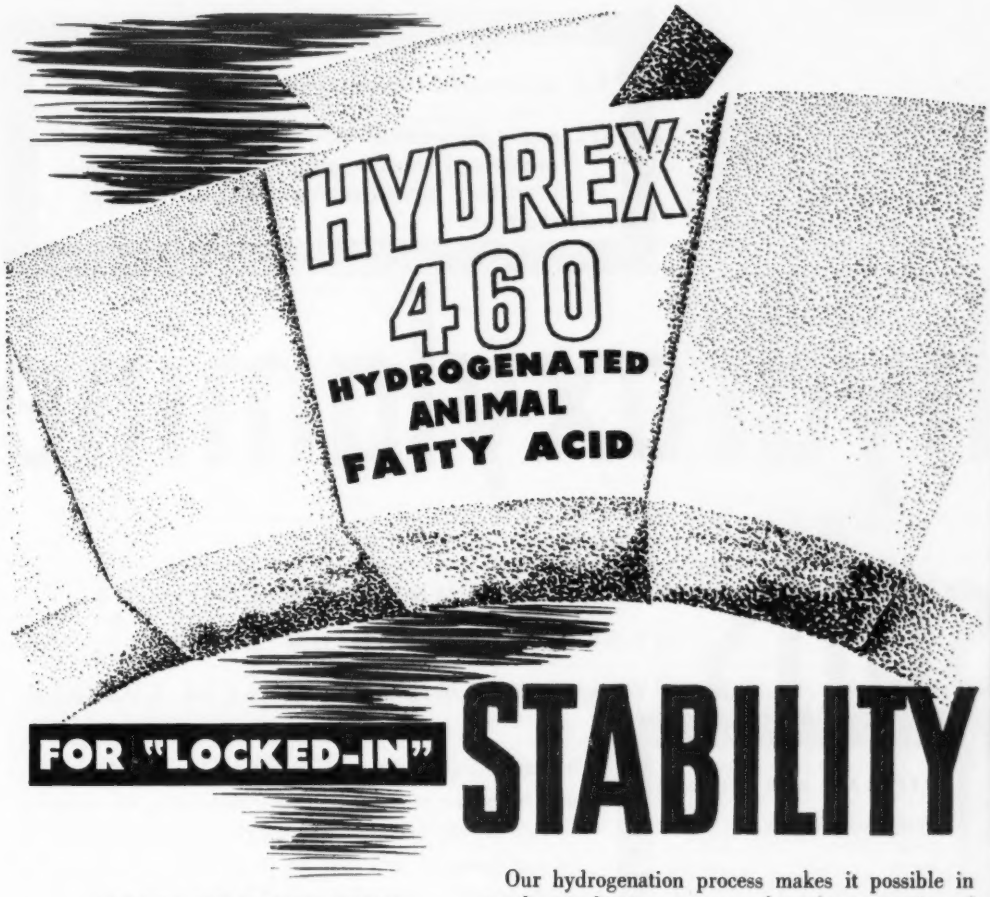
Procter & Gamble is probably of equal importance as the dominant supplier of high-ratio shortening for both household and bulk consumption, but it is not known to what extent glyceride emulsifiers are directly promoted beyond internal requirements. The two concerns along with the other major shortening producers, e.g. Capitol City Products Co., must be considered as supplying the bulk of the 60 million pounds of glyceryl stearates consumed in food products.

The other major producers of all types of fatty acid ester emulsifiers in approximate order of magnitude are: Atlas Powder, Colgate-Palmolive-Peet, Glyco Products, Emulsol Corp., and Kessler Chemical.

Secret Business: New uses have been developed for emulsifiers in recent years, but these advances have been in spite of the secrecy surrounding applications. All consuming industries would welcome more standardized products; rust inhibition and hard water performance; and for certain applications, better stability, absence of color and less toxicity. Nevertheless, the almost empirical end uses for emulsifiers, and the difficulty of obtaining reproducible performance data retard the market development of new synthetics.

Sales in the emulsifier field are quite competitive since supply generally exceeds demand. The empirical nature of end uses causes special marketing problems. To promote sales in some industries, the smaller producers have found it expedient to deal with distributors well known to the industry, such as R. T. Vanderbilt or C. J. Patterson in the baking field.

In other areas, patents on various applications or secrecy restricts competitive activity. Information concerning important market outlets is frequently, possibly habitually, withheld. For this reason, some important uses may have been overlooked.



FOR "LOCKED-IN" STABILITY

HYDREX 460 SPECIFICATIONS

Titre	(134.6—140.0°F) 57.0—60.0°C
Color 5¼" Lovibond Column (max)	4 Yellow—0.4 Red
Iodine Value (Wijs)	1—4
Free Fatty Acid (as oleic)	100—103%
Acid Number	199—205
Saponification Value	201—207

Our hydrogenation process makes it possible in regular production runs to reduce the proportion of unsaturated compounds to a minimum . . . greatly improving the stability of the fatty acid *and the end product.*

For example, Hydrex 460 Hydrogenated Animal Fatty Acid is a water-white, stable, saturated fatty acid that is relatively rich in stearic acid (about 70%), with about 30% pralmitic acid and practically free of oleic acid. Yes, with our hydrogenation technique, we are producing high melting point, low iodine value fatty acids with controlled composition. Manufacturers of fatty acid esters, metallic stearates, special lubricants and other products where *stability* is essential, should investigate medium-priced Hydrex 460 Hydrogenated Animal Fatty Acid.

W. C. HARDESTY CO., INC.
HARDESTY PRODUCTS ARE INDUSTRY'S KEYSTONE
ESTABLISHED 1926
41 EAST 42nd STREET, NEW YORK 17, N. Y.

FACTORIES: DOVER, OHIO TORONTO, CAN.

***USEFUL** as powerful reducing agents*

***USEFUL** in the manufacture of rust & polymerization inhibitors • dyes & intermediates • pharmaceuticals • photographic chemicals • rubber chemicals*

hydroxylamine salts

HYDROXYLAMMONIUM CHLORIDE
HYDROXYLAMMONIUM SULFATE
HYDROXYLAMMONIUM ACID SULFATE

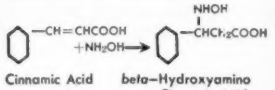
TYPICAL REACTIONS

OXIME FORMATION

$(CH_3)_2CO + NH_2OH \longrightarrow (CH_3)_2C{=}NOH + H_2O$

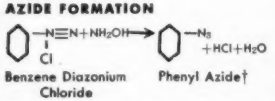
Acetone — Acetoxime

ADDITION AT DOUBLE BOND



Cinnamic Acid — *beta*–Hydroxyamino Cinnamic Acid

AZIDE FORMATION



Benzene Diazonium Chloride — Phenyl Azide†

†Due to the known instability of azide compounds, adequate safety precautions should be observed in attempting this synthesis.

The acid sulfate is the most economical source of hydroxylamine but where a purer product is necessary, the sulfate or chloride is recommended. The chloride is usually chosen for reagent purposes, such as in the determination or removal of aldehydes and ketones because it is the most soluble of the three salts in organic liquids. Therefore, it is also preferred when carrying out syntheses in non-aqueous media.

PROPERTIES

	Hydroxylammonium Chloride	Hydroxylammonium Sulfate	Hydroxylammonium Acid Sulfate
	$NH_2OH \cdot HCl$	$(NH_2OH)_2 \cdot H_2SO_4$	$NH_2OH \cdot H_2SO_4$
Molecular Weight	69.50	164.14	131.11
Melting Point °C	152d.	162d.	Indefinite
pH of 0.1M Aqueous Solution at 25 °C	3.4	3.5	1.6
*Solubility—g/100g at 25°C			
In Water	94.7	63.9	390 Approx.
In Methanol	17.5	0.1	20.2
In Ethanol, 95%	10.5	0.2	4.3
In Ethanol, Absolute	6.6	0.1	6.3
In Butanol	0.6	0.03	2.2

*These Hydroxylammonium salts are only very slightly soluble in ethers, esters, and aliphatic or aromatic hydrocarbons

COMMERCIAL SOLVENTS CORPORATION

INDUSTRIAL CHEMICAL DIVISION • 17 EAST 42ND STREET, NEW YORK 17, N. Y.

Naval Stores Bonus

USDA researchers have nursed maleo-pimaric acid to the verge of commercial introduction.

Several promising applications as a plasticizer, resin, and emulsifier, should appeal to naval stores producers . . .

Who can conveniently manufacture the compound as an intermediate in the production of high-grade rosin and turpentine.

Maleo-primaric acid, a new chemical raw material made from pine gum, will soon be sold on the commercial market. That's the news this week from the U.S. Department of Agriculture's Naval Stores Station Olustee, Fla. And good news it is to the gum naval stores industry. The new compound will be a welcome addition to a line of gum-derived products intended for chemical consumption.

A crystalline reaction product of maleic anhydride and levopimaric acid, maleo-pimaric acid was pioneered by the Bureau of Agricultural and Industrial Chemistry. Now in the final research phase, the acid is being turned out in 100-pound pilot-plant batches for testing and evaluation. Over 185 companies and private research organizations have had a look at the material and report applications in paper coatings, varnishes, synthetic rubber, printing inks and a number of other products calling for a plasticizer, emulsifier, or resin.

Turpentine and rosin producers should find maleo-pimaric acid a valuable aid in broadening chemical markets to replace industrial uses lost in recent years. Efforts in this direction have already paid off to the point where turpentine and rosin—once exclusively end products—are now regarded more and more as starting materials for useful chemical derivatives.

Can Do: The gum naval stores industry, lacking suitable production facilities, is generally at a disadvantage in chemical manufacture. But maleo-pimaric acid is one product it will be able to handle with little trouble. A good deal of gum-processing equipment, as well as many conventional operations, can be adapted to the recovery of the acid as an intermediate step in turpentine and rosin production.

As in the case of rosin and turpentine, the first step in maleo-pimaric acid production is a thorough cleaning of the crude pine gum. Conventional procedures, like the widely used Olustee process, may be used with two important reservations: Heat must be kept low to prevent isomerization of the levopimaric acid; and the clean gum must be centrifuged dry.

Clean, dehydrated gum is moderately heated with maleic anhydride for about an hour. Upon cooling, the tribasic acid reaction product precipitates as white crystals. When crystallization is complete, the maleo-pimaric acid is centrifuged, washed with turpentine and hot water, and dried. The mother liquor can be distilled in the usual manner, yielding turpentine and rosin of better-than-ordinary quality.

Rosin recovered from the process is slightly maleic-modified; melting point and acid number are higher than straight-run rosin. It would normally sell at a premium, or could be treated with additional maleic anhydride to meet the requirements of a tailor-made, maleic-modified rosin.

By-Product Bonus: Although the value of by-products is an appealing bonus, maleo-pimaric acid could make the grade on its own. Its properties suggest a number of potential applications: molecular weight is 400; acid number in acetone, 420; melting point, about 225 C. The acid is soluble in acetone, ether, alcohol, and aromatic solvents, but almost insoluble in aliphatic hydrocarbons and water. Its alkyl esters are compatible with many resins.

One very promising use is in a red pigment for printing inks. Maleo-pimaric acid can be combined with polyhydric alcohols to give alkyd resins, and with monohydric alcohols to form plasticizers. The soap of ethyl maleo-pimaric acid has been evaluated on a pilot-scale as an emulsifier in the preparation of a synthetic rubber which compares favorably with standard GR-S-10. Other developmental work is now under way.

Several companies have shown an active interest in maleo-pimaric acid. One has already decided to get into commercial production. Naval Stores Station Supervisor E. L. Patton is in touch with prospective producers and consumers in an effort to smooth out any technical obstacles. The station's pilot-production set-up now corresponds to actual plant operations; therefore data can be readily applied to commercial production.

E. L. PATTON: A boost for the gum processors.

Biological Build-Up

Although the methods of synthetic organic chemistry have constituted the chief approach to the preparation of steroid hormones, biosynthetic techniques also hold the promise of a practical route to these potent physiological substances.

Researchers of Upjohn Co., Kalamazoo, Mich. have recently come up with data which justifies a second look at biosynthesis. Slices of fresh hog adrenal glands were incubated with radioactive sodium acetate for two hours; hormones were extracted and chromatographically analyzed.

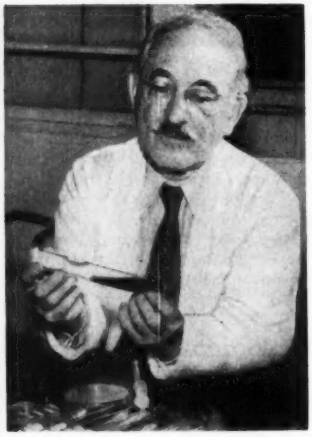
Results: Compound F (17-hydroxycorticosterone) was predominant in the extract. Smaller amounts of cortisone and traces of other hormones were also present. Radioactive content of the identified hormones was proof that the sodium acetate served as a raw material for the biological build-up of the complex steroids.

Large-scale biosynthetic production of steroids from simple, readily available compounds is an intriguing possibility for future technology.

Breaching the Barrier

For the first time an antibiotic has conquered a true virus—thus bridging the hitherto impassable gulf between bacteria and viruses. Renowned Rutgers Microbiologist Selman A. Waksman is now collating his experimental data, will unveil the new substance next week.

Isolated from a culture of an organism much like the one that produces streptothricin, the new substance, Ehrlichin*, is the only known antibiotic that copes with "true" viruses—those little-understood entities that cause influenza, polio, the common cold, and a host of other human ills.



SELMAN A. WAKSMAN: Viruses are vulnerable.

Ehrlichin is no miracle drug. It will never reach a druggist's shelf, for it is too toxic for clinical use.

Rather, its significance lies in the fact that it proves the susceptibility of viruses to antibiotic substances—and that's news. This tangible evidence of vulnerability thus opens a locked door—will spur the search for similar, but less toxic, materials. (Some of the early antibacterial substances, like actinomycin, were too toxic to use, but their discovery started researchers on the path to modern antibiotic therapy.)

There is a fine but recognizable distinction between true viruses and larger virus-like substances. Such antibiotics as chloromycetin and aureomycin attack the latter (which cause such diseases as "virus" pneumonia), but not the small, true viruses.

* Honoring Paul Ehrlich, discoverer of "606" and father of modern chemotherapy.

Ehrlichin was produced by culturing a close relative of Streptomyces lavendulae. The culture filtrate was acidified; the resultant precipitate was collected, suspended in water, neutralized and freeze-dried. Active principle of the final concentrate is heat-stable, non-dialyzable and resistant to tryptic digestion.

Tests conducted with embryonated eggs revealed Ehrlichin's power to inhibit A and B influenza viruses and the infectious bronchitis virus. Injected into mice infected with influenza B virus, Ehrlichin lessened pulmonary damage. Oddly enough, the new antibiotic is ineffective against bacteria.

Clinical use of Ehrlichin would unfortunately result in the old medical cliché, "Treatment was successful, but the patient died." But now that the barrier has been breached, the future may well bring accelerated progress in the fight against the no-longer-impregnable virus diseases.

•

New Research Organization: Lowell Textile Research Institute Research Foundation, unveiled this week, will take on industry and government-sponsored projects. Foundation personnel, abetted by institute faculty, will investigate problems involving chemistry, physics, biology, engineering, and industrial economics of textiles, paper, leather, and related areas of interest.

•

Steroid Conversion: Merck scientists report the conversion of ergosterol, cholesterol, stigmasterol, and diosgenin to a steroid containing an 11-keto group. The development marks another approach to a new process for cortisone, but it's too early for predictions.

•

Ozone Note: Electrolysis of perchloric acid with a refrigerated anode yields concentrated hydrogen-free ozone. Method, described by University of Washington researchers, gives better results than previously obtained with similar set-ups. Discovered: Ozone concentration is a function of anode temperature; lowering anode temperature boosts concentration and energy yields.

•

Once a Day: New antihistamine, effective up to 19 hours after administration, is being introduced by Wyeth, Inc. Chemically phenargen hydrochloride, the drug is characterized by high potency and low toxicity. Major selling point: Because of the prolonged therapeutic action, it can be effectively administered to hay fever sufferers just once a day. Drowsiness is a frequent side-effect.

•

Isotope Research: Radioactive isotopes research laboratory, recently established at the University of Alabama, will be available to faculty for basic research. Future plans call for expansion as a civil defense training facility. Oak Ridge had already sent equipment.

•

Glycol Splitter: Arapahoe Chemicals, Inc., is now producing a stable lead tetraacetate which can safely be stored at room temperature. Commercial application of this reagent—useful as a specific oxidizer and glycol splitter—has heretofore been limited by its tendency to deteriorate in storage. Pharmaceutical manufacture is an important potential market.

•

Furfuryl Fungicide: Eaton Laboratories is now offering 5-nitrofurfuryl methyl ether as a vetrinary fungicide. Tagged Furbenal, the agent serves as a combination fungicide-miticide, simplifying prescription problems.

•

No Taint: A food-grade ammonium bicarbonate containing 21.6% ammonia can be had from Chemical Manufacturing Co., Inc. The compound, a fine, white, crystalline material, is available in 224-pound drums for immediate delivery. Used in the manufacture of baking powder, the product leaves no residue or taint after volatilization.

•

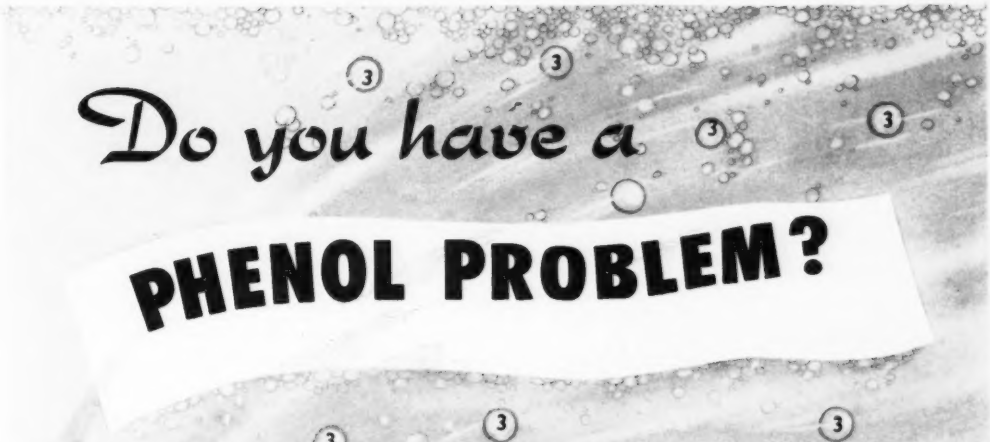
New Phosphor: British workers describe a barium pyrophosphate-titanium dioxide phosphor with luminescent properties similar to magnesium tungstate. New phosphor is a good substitute for magnesium tungstate in fluorescent lamps.

•

ATP: Pabst Laboratories, research arm of Pabst Brewing Co., is now producing disodium salt of adenosine triphosphate from its brewer's yeast. Product is 95% ATP and 5% adenosine diphosphate. Freedom from inhibitors and high purity suits it to enzyme researches, clinical studies.

•

Dual Role: Rohm & Haas Paraplex G-60 resin is a good vinyl stabilizer in addition to its primary function as plasticizer. Polyvinyl chloride films, plasticized with G-60, take reduced quantities of scarce stabilizers with no quality sacrifice.



Do you have a PHENOL PROBLEM?

If the presence of phenolic compounds in industrial waste is a problem to you and your community . . . and complete destruction is required . . . you should investigate—right now—the economical and dependable solution of that problem by low-cost Welsbach Ozone treatment.

Recent investigations reported at the 6th Annual Industrial Waste Conference at Purdue University showed that chemical oxidation with Welsbach Ozone can provide an *economical* and *complete* answer to the problem of removing phenols from industrial waste.

In addition to its relatively low cost, Welsbach Ozone treatment offers other important advantages:

- Generated at point of use. No storage problem; no procurement problem; no materials-handling.
- Fully automatic. No complicated control problems.
- No full-time supervision or labor required.
- Non-toxic end-products. No objectionable taste or odor in chlorinated water.
- Ozone-phenol reaction is instantaneous.
- Operating cost is constant and predictable; based entirely on electric power consumption. Maintenance cost is negligible.
- Welsbach Ozonators and treatment vessels require very little space.
- Welsbach Ozone also gives collateral reduction in color, B.O.D. and C.O.D.

. . . but, most of all, Welsbach Ozone is economical, convenient and dependable!

Write for complete information to:

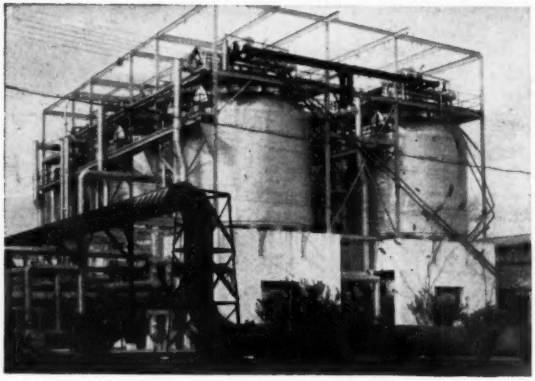
THE WELSBACH CORPORATION

OZONE PROCESSES DIVISION

1500 WALNUT STREET, PHILADELPHIA 2, PA.

SULPHUR

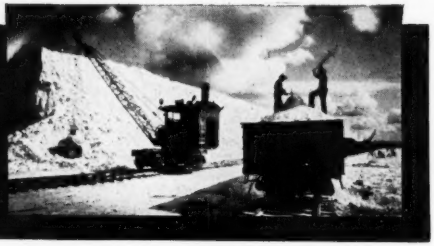
*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region



***SUPERHEATED WATER . . .** Mining operations are most successfully carried out if the water pumped into the sulphur deposit is heated under pressure to a temperature of about 320° F. For large scale mining, enormous quantities of water are required, so, a primary requisite is an adequate supply of suitable water and an efficient power plant in which to heat it.

To insure a continuous supply of water at Newgulf, it is the practice to use river water pumped in time of flood or full flow and stored in large reservoirs. This supply is supplemented, when necessary, with well water. Water so obtained is seldom suitable for use in boilers or mine water heaters without being treated first because of natural salts in solution. Softening by chemical treatment is necessary to prevent deposition of scale on boiler tubes and hot water lines.

Loading operations at our Newgulf, Texas mine



TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

REPLACEMENT of pneumatic chain hoist with a "grab-lift" truck helps Du Pont . . .

Save Dollars in Warehousing

Safe and inexpensive handling and storage of materials in containers of various sizes is a tough problem for all chemical companies. Du Pont had this difficulty at one plant. Result: A Work Simplification study was made and, today, a new dollar-saving system is in operation.

The Problem: Where the containers being handled are of equal size, palletizing usually avoids the evils of old-time warehousing practices. But palletizing does not work where large numbers of non-standard packages must be handled. Thus, prior to the study, Du Pont was still stacking containers, one on top of another. Handling was by cumbersome pneumatic hoists. This was both costly and hazardous as it was often necessary to move, usually not one but several containers, to reach the one desired.

The Solution: The Work Simplification study came up with a two-fold proposal. First, that the open warehouse bays of indiscriminately stacked packges should be replaced with ad-

BEFORE: Stacking containers of various sizes made it hazardous to reach the desired package.

AFTER: New adjustable steel shelves plus the "grab-lift" give ready access to all containers—save money.

justable steel racks for individual storage. Second, to facilitate handling, that a lift truck with a container grab attachment instead of the usual fork be purchased so that maximum use of the steel shelving could be made. This combination of lift truck and adjustable steel racks makes for easy handling and rapid location of the desired container.

Dollars and Cents: The new system is saving $13,000 per year on a capital investment of $17,000 because of the decreased handling costs.

All Glass Valve

A new all glass valve, developed by the National Bureau of Standards, provides a continuously controlled and calibrated leak for such high vacuum systems as electron tubes and mass spectrometers.

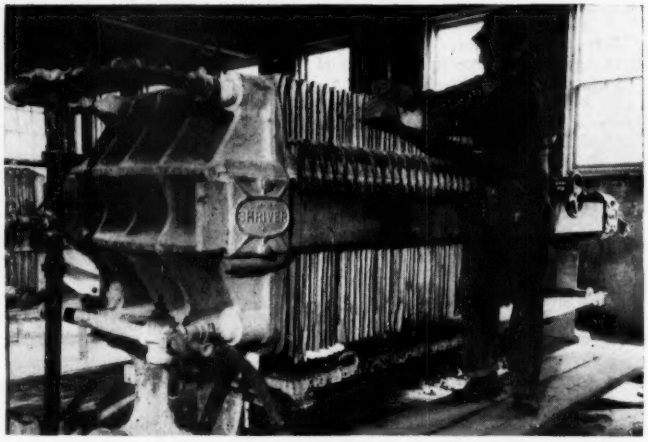
Workers at the Bureau of Standards are now busily determining the lower limit of pressure at which their new all glass valve can be used. The new device provides ready and close control over the rate at which minute quantities of gases are bled into high vacuum systems.

All Glass: The new system is all glass and depends on the thermal expansion and contraction of the glass to open and close a minute cylindrical orifice between two optically polished glass surfaces.

The appearance of the valve is that of the standard glass laboratory condenser with one end of the inner tube sealed. Also, instead of two openings in the outer tube, there is only one. A Kovar metal sleeve is placed inside of the outer tube. This is heated by an induction heater to expand and contract the glass and thus open and close the orifice.

Delicate Job: The two glass tubes are first joined together, one inside the other. Then the tubes are cut crosswise, and the surfaces thus formed polished to optical flatness. When the polished ends are again placed together, they are held in position by intermolecular force. This force is increased by hooking the central tube to a vacuum pump. Drawing a vacuum adds the external pressure to the intermolecular force. With these forces holding the unit in place the outer unit is glass-welded. Cooling adds a third force, that produced by contraction of the glass, to molecular adhesion and the external air pressure. The sum of these three forces is such that the seal is tight even at pressures as low as 10^{-6} mm. of mercury.

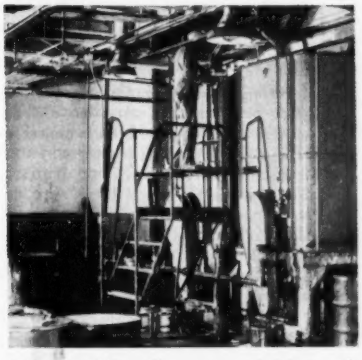
Opening: The seal is broken by the induction heating of the Kovar liner. The heat expands the outer glass sleeve and pulls the seal open, the degree of opening being dependent upon the amount of heat added.



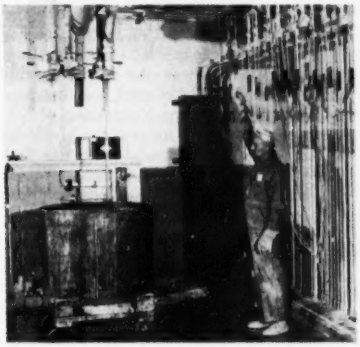
Rugged Duty Proves New Filter Cloth

Filter cloth made of dynel, Union Carbide and Carbon Corporation's new acrylic staple fiber, has just rounded out a year of heavy duty service at the Exton, Pa. plant of the Foote Mineral Company. The cloth was used in a temperature range of 70 to 200 F to filter 25% alkali brines and up to 30% caustic solutions.

Dollarwise, dynel bids to cut the costs of filter materials by 50%. It possesses the advantages of being resistant to most concentrated acids (even hot), mildewproof and easy to clean.



Ball and pebble mills are suspended from ceiling, eliminate need for multiple-story building.



Liquid raw materials are delivered by electronic control from the solvent "tank farm."

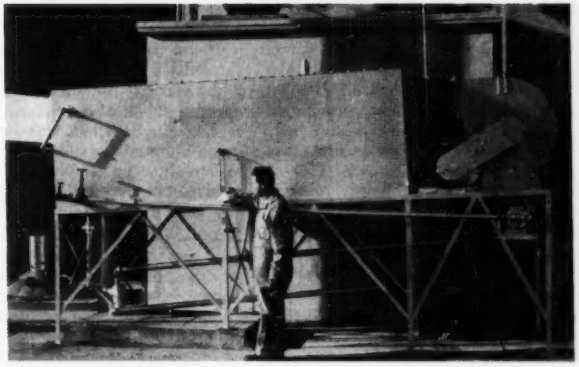
Decorative windows dominate the unusual entrance. Building is concrete and steel, is designed to be earthquake-resistant.

Now: Streamlined Paintmaking

Not too long ago paintmaking was a matter of paddles and vats, carried on in dingy plants with floors encrusted with splattered pigments and strewn with battered cans. Now it's different. This week, Pittsburgh Plate Glass Co. opened up its new plant, highlighted with a prime example the trend toward modern, streamlined paintmaking.

Located at Torrance, Cal., the $1,250,000 unit is neatly ensconced on a 15 acre site. And, instead of the conventional multiple-story construction (used to take advantage of gravity flow), Pittsburgh Plate has settled on a one-story building, uses mezzanines to facilitate straining, mill loading, mixing.

Functional is perhaps the best word to describe the new unit. All conveyor lines are roller-bearing; an automatic filler line loads, seals and labels containers; hydraulic lifts (and a roster of fork trucks) spare workmen's backs, speed throughout.



Fume disposal system is main feature of varnish cooking operation. Also installed: gas-fired resin manufacturing facilities.

Opening the Closet Door

Adulteration of vegetable waxes is on the upswing. Reasons: high prices and possible short supply.

Industry brings the problem into the open, tells how to detect common additives.

Charges of adulteration are nothing new in the wax business. They are commonly whispered in private gatherings, sometimes with justification, and sometimes with little cause. For it's natural to blame the wax when an emulsion gunks out.

But the use of additives and extenders in vegetable waxes is becoming widespread enough for some of the wax industry to expose its skeleton in the closet. The occasion was the recent mid-year meeting of the Chemical Specialties Manufacturers' Association in Chicago where the question of additives and means of detecting them were the main topics at one of its waxes and floor finishes sessions. Wax standards advocate Cyril S. Treacy* spoke freely about the problem, told why his company was sponsoring research on detection methods.

Nature's Not Perfect: Treacy is not one of those who believes that natural wax can't be improved. He thinks that out of every ten batches of carnauba, you can expect to find one that will make an outstanding emulsion; four-five that will make a pretty good one; three-four, mediocre; and one, a "stinkeroo."

Just why that is so, is hard to say in absence of sufficient chemical knowledge of the natural product, but it probably depends on how long the wax ages on the tree (carnauba palm), and how much oxidation or degradation occurs. Apparently there is a small amount of some material in wax that is critical to successful formulation of polishes, and when this is altered by time or weather, formulation difficulties increase. One large wax polish manufacturer, for example, has found that when it extracts 0.5% of carnauba, it can no longer make a decent paste polish. Absence of some such ingredient from batches of carnauba, Treacy believes, causes analogous results with emulsions, the prime outlet for the wax in "no rub" polishes.

It is pretty general knowledge that additives, such as some of the less expensive resins, improve the gloss and emulsifiability of vegetable waxes, perhaps even taking over the function of this unknown ingredient if it is missing. Treacy's position is that the consumer should add these extenders himself, according to his own formulations. For when he buys carnauba extended with cheaper resins as pure wax, he may get an emulsion, but he is also taking a licking on price. And if there is too much additive present, he may foul up his formula.

Resin Sleuths: Mamaroneck Chemical is having its work done by Charles J. Marsel, New York University professor of chemical engineering. Marsel listed a number of possible extenders for carnauba: paraffin and microcrystalline wax; synthetic resins such as Durez, Shanco, Lewisol and Piccolyte; natural resins as Damar, East India Batu and "run" Congo; hydrogenated castor oil and candelilla wax. He explained a simple method for detecting additives present in amounts of 5%.

It consists of solvent leaching a powdered wax sample and examining the extract residue, chemically and physically. Ten grams of wax are agitated in 100 cc of chloroform or toluene for 2 hours at constant temperature (25 C). The wax is filtered off, and the solvent extract evaporated to yield an "additive-enriched" residue.

Under these conditions, all common additives will be extracted. If it has been determined that .5% carnauba will be leached out, the residue from a 10-gm sample will contain .5 gm carnauba, and all the additive—.5 gm if the wax has 5% adulterant. Differences in chemical characteristics such as acid number—that can't be picked up on the wax containing only 5% extender—show up readily in the 50:50 residue, and serve to identify the kind and amount of additive.

S. C. Johnson, probably the company most active in wax research, approaches the problem another way. Three of its representatives explained its use of displacement chromotography in separating wax constituents into chemical fractions. A naphtha solution of wax is trickled through a graduated separatory funnel packed with silica gel or alumina. Paraffin and microcrystalline waxes are preferentially adsorbed, and by elution (trickling fresh solvent down the column), they can be recovered for examination.

Strong Temptation: One look at the price per pound of carnauba ($1.30), ouricury (93¢ a pound) and candelilla (75¢ a pound), and it is clear why the temptation to slip in 5% or more of 20¢ resin is so great. The desire to stretch stocks against possible days of shortages also is a factor, especially since the buyer may be quite happy about the performance of the material he gets.

The wax business is one of the most competitive of the specialties field at all levels. Polish makers are always trying to beat their suppliers down a cent or two, and wax suppliers try to shade each other's prices by similar margins to get business. But today, the industry feels that for certain batches of refined wax to sell as closely as they do to the price of the crude, extenders must have been used, and that goes beyond just sharp competition.

Some feel the answer lies in admitting the situation, and trying to find better ways to insure the consumer that he is getting a pure refined product for his money.

•

Laminate Coating: Polyester laminates may now be coated as a result of research by Bee Chemical Co. (Chicago). "Logoset", their new coating material, bypasses former difficulties to provide a stable treatment for reinforced plastics.

Metal-short manufacturers of household appliances, office equipment, signs and furniture have been eyeing reinforced plastics for some time. Lack of good coating materials has been the stumbling block. Polyester laminates become insoluble in organic solvents after heat treating. While this fact allows the use of numerous solvents and resins for finishes, it also precludes the possibility of obtaining adhesion by controlled solvent action.

New Logoset overcomes these difficulties and produces a coating that withstands heat embrittlement, humidity, salt spray, weather, sunlight, and the rigorous "Scotch-Tape" adhesion test.

•

Coating Stripper: Surface coating removal without the hazards of toxicity, explosion and skin irritation is the promise of Wilsolve, new product of Lowebco, Inc. (Chicago). It is designed for use on varnished, shellacked, or plastic-coated floors; inlaid linoleum; and wooden furniture.

* Vice president, Mamaroneck Chemical Corp., a wax refiner.

Wilsolve has low toxicity, can be used in large confined areas, requires no steel-wooling or sanding and no after-rinse prior to recoating. It is non-explosive and non-irritating to the skin, containing no benzol, acetone, wax, acids, or alkalis. It does not raise grain on wood and does not soften or affect the color of inlaid linoleum. It is not a paint or lacquer remover.

The liquid will shortly go national at prices varying from 85¢ per ⅛ gal. to $3.95 per gal. in department, paint and hardware stores.

•

Dust Magnet: Applied, dried, and tried on dusting cloths and mops, "Dust Absorber" removes instead of redistributing dust. Parlee Co. of Indianapolis, Ind. markets the dusting-polishing liquid treatment at prices varying from 59¢ per pint to $2.95 per gal. in 55 gal. drums.

It contains no oils, leaves no streaks and involves no fire hazard. Clean cloths or mops are soaked in the liquid in a pan. Excess is wrung out and returned to the bottle. The treated duster is dried thoroughly before use and when quite soiled, it can be laundered and retreated for further use.

•

Sham Chamois: Miracloth Corp. (Chicago) has just made first shipments of a latex-impregnated, non-woven fabric called Mira-Sham. A replacement for chamois cleaning cloths, it is claimed to be longer-wearing and more chemically-resistant than the natural material. Household size (18 x 19 in) sells for 79¢. Larger sizes (up to 36 x 39 in) are available for the automotive trade.

•

Scorpion Killer: National distribution is ahead for "scorpiocide", Lien Chemical Co.'s (Franklin Park, Ill.) product for scorpion control that has proven a success with Southwestern householders. It is also effective against spiders, centipedes, moths, beetles, ants. Active ingredients are methylated naphthalene, DDT, chlordane, pyrethrins, ethylene glycol monobutyl ether and di-N-propyl maleate isosafrole in a petroleum distillate. Household sizes are the pint at 98¢ and quart at $1.59, both in bottles. Gallon cans for institutional use retail at $6.00.

PICTURES IN THIS ISSUE:

Cover (top)—Vachon; Cover (middle)—Sherwin Williams; Cover (bottom)—Parks; p. 21—Official Dept. of Defense Photo.

BOOKS . . . . . .

Capacitors for Industry, edited by W. C. Bloomquist. John Wiley & Sons, Inc., New York, N. Y., vii + 246 pp., $4.50.

One of a series written by General Electric authors in the field of engineering practice, this volume proposes to set forth essential practical application information concerning capacitors, the lack of this data having inhibited the use of capacitors in industry heretofore. Intended primarily for the plant engineer, utility power salesman, consulting engineer, and the industrial power application engineer, the book furnishes information and data in tabular and curve form so as to afford practical solutions quickly and easily.

The Peanut—The Unpredictable Legume. The National Fertilizer Association, Washington 5, D.C.; $4.

With each chapter written by an expert on a particular aspect of the subject, this book summarizes the mass of available information on the peanut—including facts about its cultivation, fertilization, harvesting and storage. Other topics covered are historical background, economic importance, cultural practices, insect pests and plant diseases, etc.

Water Treatment for Industrial and Other Uses, by Eskel Nordell. Reinhold Publishing Co., New York, N.Y.; 525 pp., $10.

A comprehensive, practical book devoted to the subject of water—its impurities and the methods of treating it so as to fit it for multiple uses in industry and other spheres. Includes information on chemical reactions, current water-treatment practices in various industries, processes and equipment used in treating water as well as tables of conversion factors and equivalents.

Briefly Listed

MARINE PRODUCTS OF COMMERCE by Donald K. Tressler and James McW. Lemon, 782-page volume devoted to all commercially important products of the sea, the technique of obtaining them, and the science and technology of their preparation and preservation. Published by the Reinhold Publishing Co., 330 West 42nd St., New York, N.Y., at the price of $18.

A NEW METHOD OF SYNTHESIZING AMIDES OF CARBOXYLIC ACIDS, English translation of a report from the "Journal of General Chemistry" of the U.S.S.R., Dec., 1949, outlining a new method for the synthesis of carboxylic acids directly from the acids themselves by the action of sulfamide on these acids in the presence of pyridine. May be obtained from Consultants Bureau, 152 W. 42nd St., New York, N.Y.; $5.

ANNOTATED BIBLIOGRAPHY OF VITAMIN E, from 1940 to 1950, compiled by Philip H. Harris and Wilma Kujawski, 184-page publication intended to keep physicians, biologists, and chemists up-to-date on recent developments in vitamin E research; brief abstracts accompany most of literature references and review primary research results with the emphasis usually on the physiological aspect. Distributed by The National Vitamin Foundation, Inc., 150 Broadway, New York 7, N.Y., for $3 per copy.

THE NATURE OF METALS, by Bruce A. Rogers of the Atomic Institute, Ames Laboratory, written for chemists, engineers and metallurgical students, deals with the structure of metals and their behavior under various stresses, heating, corrosion, etc. Published by the Iowa State College Press, Ames, Iowa.

MATHESON GAS DATA BOOK, second edition covering 61 different gases, describes their properties, toxicity and safety devices, as well as handling techniques and recommended controls for each gas; a new feature included is cylinder valve outlet charts. Can be obtained from The Matheson Co., Inc., East Rutherford, N. J. at $2. per copy.

STUDIES ON SYNTHETIC LUBRICANT OIL PB 101 870, 12-page report reviewing 27 years of studies in the field of synthetic lubricant oils carried on by the German firm, I. G. Farben. Available from the Office of Technical Services, U.S. Dept of Commerce, Washington 25, D.C., for 50¢.

MEETINGS . . .

Natl. Assn. of Purchasing Agents, annual meeting, Waldorf-Astoria Hotel, New York, N.Y., June 3-6.

Amer. Leather Chemists Assn., Griswald Hotel, Groton, Conn., June 11-13.

Natl. Fertilizer Assn., annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 11-13.

Natl. Organic Chemistry Symposium, Shirley-Savoy Hotel, Denver, Colo., June 12-15.

Amer. Council of Comml. Laboratories, Ambassador Hotel, Los Angeles, Calif., June 14-15.

Mfg. Chemists Assn., annual meeting, joint outing with SOCMA, Greenbrier Hotel, White Sulphur Springs, W. Va., June 14-16.

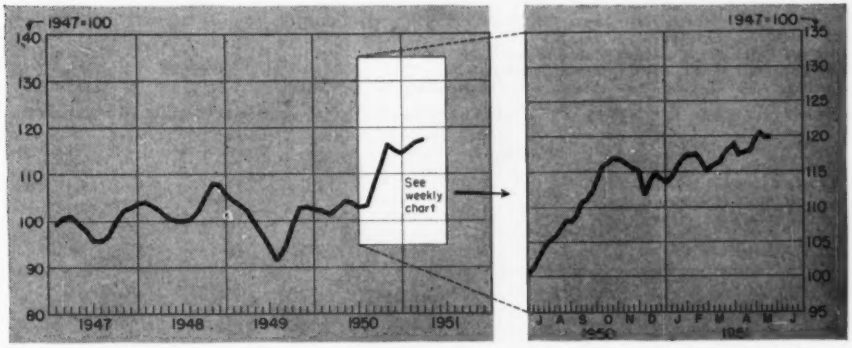
Synth. Org. Chem. Mfrs. Assn., joint outing with MCA, Greenbrier Hotel, White Sulphur Springs, W. Va., June 14-16.

Amer. Plant Food Council, annual meeting, The Homestead, Hot Springs, Va., June 14-17.

Chem. Inst. of Canada, annual conf., Winnipeg, June 18-20.

Amer. Soc. for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, June 18-22.

CHEMICAL MARKETS



CHEMICAL INDUSTRIES OUTPUT INDEX — Basis: Total Man-Hours Worked in Selected Chemical Industries

This week, a desperate delegation from the chemical industry is camped on the doorstep of the Office of Price Stabilization, pleading for relief from a muddled price setup. Typical complaint of one delegate: higher naval stores ceilings have been expected any minute for a month, while producers try to hold their labor force, now tempted by higher pay elsewhere.

During the rest of this month, several groups from the chemical industry will meet with OPS to consider feasibility of tailor-made pricing regulations covering problems of particular impact to those divisions. Chlorine-caustic and heavy chemicals representatives will participate in some of the first meetings.

Chemical importers are still on the war-path over OPS policy. In their view, the dollars-and-cents markup is unrealistic, because soaring costs since Korea have cut their percentage margin in two. These protests were made to an OPS representative in New York this week, but early relief by the harassed price agency is not in sight.

On June 6, the Torquay pact tariff concessions, covering a host of chemicals, will take effect among the early signatories. Of this group, Canada is by far the largest in terms of U.S. trade. Later signers include France and Italy. Chief abstainers: United Kingdom and Cuba.

U.S. chemical manufacturers are not seriously affected by imports on the present scale, as long as chemicals continue in a generally short supply position. But they are keenly aware that supplies of many chemicals have improved during the past month. Notable examples: soda ash, liquid caustic, hydrochloric acid and vinyl plastics.

Stepped-up imports have contributed to recent price declines of urea, trichlorethylene, and soda ash. Last week's U.S. imports, including 1,040 bags of urea, 382 drums and 213 casks of trichlorethylene, and 16,000 bags of soda ash, maintained the accelerated trend.

MARKET LETTER

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Chemical Industries Output Index (1947=100)	120.1	120.3	103.6
Bituminous Coal Production (Daily Average, 1000 Tons)	1,603.0	1,618.0	1,684.0
Steel Ingot Production (Thousand Tons)	2,071.0	2,077.0	1,941.0
Wholesale Prices—Chemicals and Allied Products (1926=100)	144.1	144.4	116.5
Stock Price Index of 14 Chemical Companies (Standard & Poor's Corp.)	233.9	246.4	191.3
Chemical Process Industries Construction Awards (Eng. News-Record)	$9,006,000	$1,023,000	$11,320,000

MONTHLY BUSINESS INDICATORS	MANUFACTURER'S SALES			MANUFACTURER'S INVENTORIES		
(Million Dollars)	Latest Month	Preceding Month	Year Ago	Latest Month	Preceding Month	Year Ago
All Manufacturing	$23,441	$22,666	$17,797	$36,396	$35,488	$29,073
Chemicals and Allied Products	1,729	1,631	1,250	2,514	2,424	1,978
Paper and Allied Products	715	686	510	828	791	703
Petroleum and Coal Products	1,808	1,795	1,550	2,165	2,133	2,049
Textile Products	1,423	1,407	963	3,127	3,046	2,042
Leather and Products	331	365	285	621	598	509

Three import-inspired price tumbles occurred this week on chemicals only recently in tight supply. Carbon tetrachloride fell 3¢ to 13½¢ a pound, is 3½¢ above manufacturers' price; trichlorethylene also fell 3⅛¢, to 15½¢, shows the same differential; and chromic acid, dropping 17¢, is still 16¢ above the manufacturers' level of 28¢.

Some widely sought plastics gave evidence of strengthening supply. Polystyrene is now quoted at 58¢ a pound compared with 76¢ only two weeks ago; even the cry for polyethylene was less urgent as the price dropped 30¢ a pound from the previous resale pinnacle of $1.15. Much of this reaction can be traced to inventory build-up.

Some weakness in plasticizers had developed as a result of the slackened pace in plastics. However, tricresyl phosphate users still face a 3 months' backlog of orders. Factor: Shortage of phosphorus oxychloride keeps producers on a catch-up-as-catch basis.

Many other items are still critically short, even though the better-supply list of chemicals grows longer. For instance, naphthalene (to make phthalic anhydride) is scarcer because imports for the current year will be only half of last year's whopping total of 110 million pounds. One reason: Foreign suppliers are making their own intermediates.

On the domestic front, the National Petroleum Council has just concluded a survey of now-short and soon-short chemicals. Some of the prospective shortages include carbon black, hydroquinone, disodium phosphate, and alkyl aryl sulfonates. The last-named will be hardest-hit because of large detergent needs, and benzene and sulfuric acid shortages.

Resorcinol, latest addition to NPA chemical allocation M-45, will remain on the hard-to-get list until early 1952. By that time, new production will ease the consumers' plight.

SELECTED CHEMICAL MARKET PRICE CHANGES—Week Ending May 21, 1951

	Change	New Price		Change	New Price
UP					
Candelilla Wax, crude	$ .01	$ .75	Rosin, gum, Savannah, WW, cwt.	$ .70	$ 9.50
Menthol, nat., USP	.35	11.85			
DOWN					
Castor Beans, fob, Brazil, long ton	25.00	260.00	Montan Wax, dom., ref.	.005	.31
Coconut Oil, crude, tanks, Pac.	.015	.155	Neostygmine methyl sulfate, gram	17.00	3.00
Eucalyptol, 85%, NF	.25	1.55	Progesterone, USP,100gr.,per gram	.70	2.75
Linseed Oil, raw, tankcar	.005	.22	Tung Oil, tanks	.0025	.40
Mercury, 76 lb. flask	2.00	213.00			

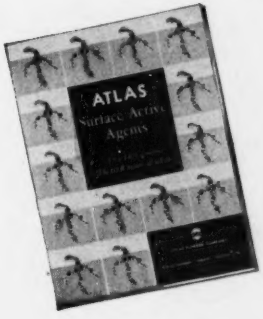
All prices per lb. unless quantity is stated

The Atlas HLB System

Eliminates "By Guess and By Gosh" Methods of Choosing Emulsifiers!

There is no need to experiment with hundreds of emulsifiers just to find the right one for *your* job. Atlas made a big step toward eliminating this guesswork two years ago by pioneering the Atlas HLB System. This method of choice is based on empirical numbers representing the Hydrophile-Lipophile Balance (HLB) of emulsifiers.

The HLB System has been greatly expanded since its introduction and today includes not only HLB numbers for emulsifiers, but for the materials to be emulsified: oils, fats, waxes. This opens the door to greater progress in the development of *new* products and *improved* products.



The up-to-the-minute data on the HLB System—the only one of its kind—is found in the new Atlas Surface Active Agents booklet. You'll find it a valuable tool in the fast selection of the comparatively few surface active agents applicable to a particular problem calling for an emulsifier, solubilizing agent, detergent, wetting agent, foaming or anti-foaming agent. This booklet is *free*—ask for it on your official stationery.

ATLAS CHEMMUNIQUÉ

Sorbitol demand grows as new facilities near completion date

Large users of polyols today are actively investigating the many advantages of sorbitol in preparation for increased sorbitol production facilities to be ready this fall. Many have already made definite plans to use it. Greater STABILITY is the main reason for sorbitol's increasing popularity—stability of moisture content at changing humidities—stability of price—stability of future supplies.

Protecting Freshness of Candy for Fighting Men

SORBO* meets Quartermaster Corps specifications for the sorbitol needed in fudge for our fighting forces. Sorbitol is used at over 9% solids concentration to help protect against premature staling, and keep the fudge pleasantly soft.

Fifty Candles for Marshmallows

1951 marks the Fiftieth Anniversary of the modern marshmallow. Thanks to sorbitol, today's marshmallows are better than ever—more tender and "short," and having a finer and more uniform cell structure. Some of the advantages sorbitol gives the manufacturer are: shorter whipping time; easier casting operation; quicker "set."

*Reg. U. S. Pat. Off.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*
ATLAS POWDER COMPANY, CANADA, LTD., Brantford, Canada

DEMPSTER DUMPSTER SYSTEM

SERVING COST-MINDED MANAGEMENT FROM COAST TO COAST

. . . handling bulk materials of every description at phenomenal savings

Photos show the three simple stages of servicing a container. The Dempster-Dumpster, operated from hydraulic controls in the cab by one man, the driver, picks up each container, places it in carrying position, and hauls it to point of disposition where it may be dumped or set down intact.

● **The General Electric Company, well known for sound management, is among the hundreds of cost-minded manufacturers using the Dempster-Dumpster System of bulk materials handling . . . the system recognized across the nation for its efficiency and ability to reduce costs!**

Cuts Cost of Equipment and Operation — One truck-mounted Dempster-Dumpster performs the work of from 3 to 5 conventional trucks . . . reducing investment, maintenance and man hours tremendously.

Eliminates Standing Idle Time—Truck never stands idle while being loaded nor do loading crews stand idle while truck makes haul. One Dempster-Dumpster services any number of detachable containers ranging in size up to 12 cu. yds. and in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids, liquids or dust . . . trash or rubbish.

Eliminates Re-Handling of Materials—Dempster-Dumpster Containers are placed at the very spot where materials accumulate—inside or outside buildings. Materials placed in these containers remain there until taken to destination and dumped or set down intact.

Increases Efficiency, Sanitation and Good "Housekeeping"—The Dempster-Dumpster System is a complete, unified plan for plant-wide cleanliness. Containers built to handle trash and refuse are fire-proof, rat-proof and fly-proof. Contents cannot be scattered by wind or scavengers. Regardless of your particular materials handling problem . . . raw products, finished products, trash or rubbish—it will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers. . . All Designs. . . All Sizes

DEMPSTER BROTHERS, 251 Dempster Building, Knoxville 17, Tennessee

MUTUAL'S NEW PLANT: Chromates will move along faster.

Chromium Prospects Bright

Consumers of chromium chemicals anticipate an easier time as more soda ash supplies become available.

Trend to modernization of chromate process will become industry-wide, will mean higher output and less operating labor costs.

U.S. chemical industry and the Bureau of Mines look ahead to using domestic ore, if overseas supply is cut off.

Users of chromium chemicals may soon get some relief from the shortage doldrums. If so, it will be due to the penchant for modernization that is taking hold of the industry. Typical of this trend is the completely modernized plant of the Mutual Chemical Company of America which recently swung into its full production stride.

There is every likelihood that the drive toward rehabilitation and modernization will continue in the industry. Other manufacturers are eyeing the Mutual streamlining job as the shape of things that must come. The benefits of the process economies, lower labor costs and greater uniformity of products are obvious to them.

Big Four: Today, only four companies are producing chromates in the United States. In volume, Mutual is the largest. Its plants at Baltimore and Jersey City turn out a healthy sized amount of industry's chromium supplies. Diamond Alkali, is the producer next in size with plants at Painesville, Ohio and Kearny, N. J. Natural Products Refining Company at Jersey City is another member of the chromium quartet. And Imperial Paper and Color Company is the fourth member, although it applies most of its output to captive use in pigments.

Chromate Outlets: The heavy tonnage of chromium chemicals output is in the form of sodium bichromate. And the uses for this compound have mushroomed, particularly since the end of World War II.

A recent survey of the various destinations of chromates revealed that almost 50% of the output ends up in pigments and for roofing granules, 15% is used in leather tanning, 15% in other chromium chemicals, and the balance (over 20%) is used in the prevention of metal corrosion and in the dyeing of textiles.

This last use is probably the fastest growing. Such diverse needs as the corrosion protection of oil well drilling equipment, cooling systems for internal combustion engines and for brine refrigerating units are calling for ever larger amounts of chromate and bichromate salts.

Limiting Factor: Supplies of soda ash have always been a controlling factor in chromate production. And the soda ash strike of last summer made this stingingly apparent. The shortage of soda ash cut chromate output by more than one third. And even after production was restored, the increasing demand for soda ash by other industries, has bridled chromate production and kept users waiting and wanting.

Actually, it is only a matter of weeks since soda ash supplies have showed any promise of gaining on the oversized backlog of orders. A comfortable supply of chromates is still some way off. But things are better . . . and will get still better.

Defenses Up: All considerations of continued expansion of chromate production presumes that imports of high-grade chromite ore (raw material for chromates) from overseas will continue. But the defense effort, in need of ever greater supplies of chromium compounds could be disrupted if the thin and vulnerable supply line were cut by hostile action. For this reason processes for the utilization of low grade ores (more readily available) have been urged by the Bureau of Mines.

The Future: Experts feel that a high water level of chromate output will be reached sometime this summer. The reason given is that production moved during the first quarter of this year at a 120 thousand ton per annum clip. This happened even before the new Mutual Chemical plant began to make its full contribution. The 120 thousand ton figure will be a welcome improvement over the 95 thousand ton-a-year figure of the postwar era, and the 85 thousand ton level that was hit during last year's soda ash strike.

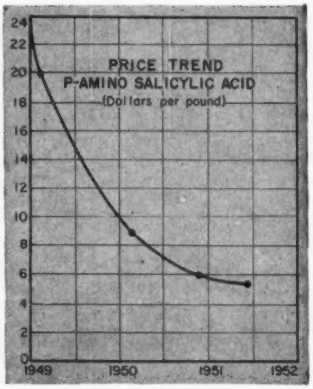
Price High: For the near future, however, chromium chemicals will continue to be scarce. A sure indication is that in the current resale market, sodium bichromate brings from 26-28¢ a pound . . . a very lofty position when compared to the price congealed manufacturers' prices of 10½¢ a pound (carloads) and 12¢ a pound in less-than-carload lots.

PAS Takes a Dip

Few would have predicted, even five years ago, the active demand for p-amino salicylic acid that brought another price mark-down this week to $5.50 a pound. The future of PAS

seemed destined to fill only a minor role on the laboratory shelf. But the discovery of the efficacy of PAS in tuberculosis therapy has radically altered this status, bringing keen interest from the medical profession and keen competition from the producers who have ventured to fill the growing demand.

The results of this improved stature for PAS have brought the price down from $20 a pound in early 1949 to $6 a pound in late 1950. (*CI* November, 1950.) Latest decline this week brought the quotation by one manufacturer to $5.50, and within 24 hours the other producers had matched the reduction.



Grapevine: It is still too early to evaluate the specific reason behind the lower price levels. Most producers are acting pretty cagey because of the highly competitive nature of the present situation, although the most likely explanation is that one manufacturer is boosting production. Other rumors are also circulating, of varying degrees of credibility.

In view of the possibility of increased competition from abroad the U.S. manufacturers are doing plenty of scouting around to find the extent of the available and potential market. If prospects look favorable for expansion the early bird still gets the reward.

GOVERNMENT NEEDS

Bid Closing	Invitation No.	Quantity	Item
Procurement Division, Veterans Administration, Washington 25, D.C.:			
May 31	S-51	114,000 lbs. (100-lb. bags)	sodium metaphosphate
May 28	S-247	315,700 lbs.	soduim metasilicate pentahydrate
Federal Supply Service, General Services Administration, 250 Hudson St., New York, N.Y.:			
May 31	NY-2H-29166	various quantities	paint, enamel, varnish, thinner, paint remover
Depot Quartermaster, U.S. Marine Corps, Depot of Supplies, San Francisco, Cal.:			
May 31	1614	41,150 gals.	carbon remover solvent (Army Spec. 4-1120)
General Services Administration, P.O. Box 5127, Cleveland 1, Ohio:			
May 29	CL-3199-51	800 cans	paste floor wax
Navy Purchasing Office, Los Angeles, Cal.:			
July 7	8835	5,000 gals.	glycerin
Aviation Supply Office, 700 Robbins Ave., Philadelphia, Pa.:			
May 21	B-54065	16,000 lbs.	dry mercuric oxide pigment, (Spec. Mil M-15177)
May 22	B-54072	1,536 pints	acetone
May 22	B-54072	150,000 gals.	acetone (1 gal).
May 22	B-54072	100,000 gals.	acetone (5 gal).
General Services Administration, 1114 Commerce St., Dallas, Tex.:			
May 22	FW-13959	28,000 lbs.	laundry soap (P-S-641-A)
May 22	FW-13963	600 cans	DDT insecticide (0-1-558)
May 22	FW-13956	9,000 lbs.	scouring compound (powder)
May 22	FW-13956	18,000 lbs.	laundry soap (chip) (P-S-556-A)
May 22	FW-13956	30,016 lbs.	soap powder (P-S-606-A)
Commandant of the Marine Corps, Washington 25, D.C. (Attn: Supply Dept., Procurement Sec.):			
May 25	1795	various quantities	cresolic disinfectant (tentative Marine Corps Spec.)
Federal Supply Service, General Services Administration, 250 Hudson St., N.Y.:			
May 31	NY-2R-29036	22,800 lbs.	soap powder
Chief, Procurement Div., Supply Service, Veterans Administration, Washington 25, D.C.:			
May 21	S-244	232,632 lbs.	scouring powder
May 21	S-244	562,500 lbs.	soap powder
Navy Purchasing Office, 111 E. 16 St., New York, N.Y.:			
May 24	8797	53,520 gals.	aqua-ammonia
May 24	8816	34,000 gals.	trichorethylene
Federal Supply Services, General Services Administration, Region 3, Washington 25, D.C.:			
May 25	99930/3/	34,400 gals.	trichorethylene
May 25	99930/3/	52,500 lbs.	sodium sulfite (anhydrous)
May 29	3W-10019	22,500 lbs.	soap grit

GOVERNMENT AWARDS*

Item	Supplier	Location
Chicago Chemical Procurement District, Chicago 6, Ill.:		
chlorinated paraffin, Type I, CC stock no. 135901	Hooker Electrochemical Co.	Niagara Falls, N. Y.

* Security regulations prevent disclosure of quantity and dollar volume.

Benzene Look-In

By the end of 1952, nearly 100 million gallons of benzene from petroleum will become available for chemical products vital to projected U.S. requirements, both civilian and military. With allocations to cover unforeseen emergencies, and stepped-up output from coal tar benzene, the expanded output is expected to meet most needs at that time.

But the problem today is how to stretch the supply of available benzene and other aromatic chemicals during a period when demand is outrunning supply—and increasing the margin each month. In fact, the most severe shortage in aromatics will occur around the early part of 1952 before the new capacity can chew away at the backlogged demand.

Expert Estimates: These estimates are based on the findings of a benzene industry task group, representing 90% of the U.S. benzene consumer industries, and summarized by L. A. Schlueter, Chief, Aromatics Chemical Division of the NPA. The immediate scarcity of benzene will get about 20 million gallons worse in the third quarter of this year because of the demands of new styrene, phenol, and aniline capacity going on stream.

At the present time, U.S. benzene supplies add up to 230 million gallons yearly. Of this, 170 million is derived from coal tar, 20 million from petroleum, and the remaining 40 million from imports, chiefly from Britain and Germany.

According to Schlueter, steps are being taken to up imports from overseas from 40 million to 60 million gallons this year when the need is most urgent. Whether this can be done is somewhat dubious, mainly because European chemical manufacturers are showing much stronger interest in developing their own chemical intermediates. But the effort is worth a strong try.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

EMPLOYMENT WANTED and Individual Selling Opportunity undisplayed rate is one-half of above rate, payable in advance.

PROPOSALS, $1.20 a line an insertion.

INFORMATION

BOX NUMBERS count as one additional line in undisplayed ads.

EQUIPMENT WANTED or FOR SALE Advertisements acceptable only in Displayed Style.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $8.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches —to a page C. I. W.

NEW ADVERTISEMENTS received by 10 A. M. May 29th at the New York Office, 330 W. 42nd St., New York 18, N. Y., will appear in the June 9th issue subject to limitations of space available

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

SALESMAN—FOR selling core binder material to foundries; requires previous foundry experience or engineering experience; age 30-35; salary range $350-$450 per month. Submit complete resume. SW 9806, Chemical Industries Week.

WANTED

ANYTHING within reason that is wanted in the field served by Chemical Industries Week can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

TECHNICAL EXECUTIVE

Chemical engineer, experienced in production, research consulting and personnel management. Desires managerial post in company training programs, supervisory or advisory capacity in production or development in a chemical industry. PW 9589 Chemical Industries Week, 330 W. 42nd St., New York 18, N. Y.

BOUGHT — SOLD

Glycols — Cellosolves — Ethanolamines
Titaniums — Lithopone — Zinc Oxide
Bichromates — Dyes — Colors, etc.
Soda Ash — Caustic Soda

CHEMICAL SERVICE CORPORATION
96-02 Beaver St., New York 5, N. Y.

An Investment !

Productive advertising is an INVESTMENT rather than an EXPENDITURE.

"Searchlight" advertisers almost invariably report prompt and satisfactory results.

BE CONVINCED — send us your advertisement TODAY.

Address Classified Advertising Division

Chemical Industries Week
330 W. 42nd St., New York 18, N. Y.

GEAR UP FOR BIGGER PRODUCTION WITHOUT DELAY

GOOD USED EQUIPMENT

Ready for Immediate Shipment

It's Impossible to List in this space the 5000 Machines available from your FIRST SOURCE

Send for our Latest List

FIRST MACHINERY CORP.
157 HUDSON ST.
WOrth 4-5900
NEW YORK 13, N.Y.

"CONSOLIDATED"

BUYS and SELLS
USED MACHINERY
FOR THE
CHEMICAL & PROCESS INDUSTRIES

Including Paint, Food, Rubber, Plastics, Sugar, Drugs, Cosmetics and Allied Fields. From a single item to a complete plant.

CASH FOR YOUR IDLE EQUIPMENT

CONSOLIDATED
PRODUCTS COMPANY, INC.
14-18 Park Row, New York 38, N. Y.
BArclay 7-0600

LIQUIDATING EQUIPMENT
former ALCOHOL PLANT

Capacity 1200 W.G. of 190 proof alcohol per day.

DISTILLATION EQUIPMENT
COOKING EQUIPMENT
YEAST EQUIPMENT
TANKS, PUMPS, ETC.

Write for list.

PERRY EQUIPMENT CORP.
1521 W. Thompson St.
Phila. 21, Penna.

STEEL STORAGE TANKS

3 - 25,000 GAL. 10' x 40'
18 - 10,000, 15,000 & 20,000 GAL.
15 - 8,000 & 10,000 GAL. R. R. TANKS
L. M. STANHOPE, ROSEMONT, PA.

AVAILABLE . . .

CUSTOM REFINING FACILITIES
- Distillation
- Extraction
- Separations
- Fractionations

Drum Lots—Tank Cars

WANTED . . .
- All Types of Crude Mixtures
- By-Products
- Residues
- Wastes
- Contaminated Solvents

TRULAND
Chemical & Engineering Co. Inc.
Box 426, Union, N.J. UNionville 2-7260

PROFESSIONAL SERVICES

EVANS
RESEARCH AND DEVELOPMENT CORP.
Chemical Research ▶ Processes ▶ Products
Development Problems
Complete Laboratory ▶ Pilot Plant ▶ Mechanical and Optical Sections
Ask for NEW Scope Sheet C listing over 100 of our activities.
250 East 43rd Street, New York 17, N. Y.

FOSTER D. SNELL
CHEMISTS AND ENGINEERS
29 WEST 15TH ST. NEW YORK 11, N.Y.
PHONE WATKINS 4-8800

CHEMICAL CONSULTATION, RESEARCH, DEVELOPMENT

THE RANRAY CORP.
Research Division
340 CANAL ST., NEW YORK 13

- Product and Process Development
- Sponsored Industrial Research
- Custom Organic Syntheses
- Chlorination Processes
- Chemotherapeutics
- Microanalyses

Phone: WAlker 5-7990

Additional Searchlight Advertising on page 50

READER SERVICE . . . . .

HOW TO USE COUPON

Mail the coupon at the bottom of page. Circle page numbers of items about which you want more details. Then write your name and address and mail it to us. Your request will be forwarded to companies concerned, the answer coming direct to you.

MAKES IT HANDY

Products and literature in this issue are listed on these pages. There are three indexes. (1) Editorial items on new products, new equipment, new literature; (2) products advertised. (3) The index of advertisers is on the following page.

THE NUMBERS

Advertisements:—There is a page number on the coupon for each advertisement. Before the number, may appear, L, R. T. B (left, right, top, bottom), locating the ad on the page; small letters following (a,b,c) indicate additional products in the advertisement.

Editorial Items:—Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the coupon for each item referring to new products, equipment, and literature.

EDITORIAL ITEMS

For more data, circle number on coupon

NEW PRODUCTS

Ammonium Bicarbonate 11D
Furbenal 11C
Lead Tetraacetate 11B
Phenargen Hydrochloride 11A

NEW EQUIPMENT

Filter Cloth 38A

TECHNICAL LITERATURE

CHEMICALS

Germicide 52B
Silicone-Alkyd 52A

EQUIPMENT

Block Insulation 52K
Conduit System 52G
Conveyor and Timing Unit 52L
Jacket Water Coolers 52E
Liquefied Gas Production 52C
Miniature Ball Bearings 52J
Packing Rings 52D
Scientific Apparatus 52F
Viscosity Packet 52H
Water Conditioning 52I

PRODUCTS ADVERTISED

For more data, circle number on coupon.

Ammonium bicarbonate 14
Anhydrous glauber's salt 54
Anhydrous sodium metalsilicate B1
Animal oils T42a
Boric acid T15a
Detergents, nacconol 29
Fatty acids T42c
Fatty acids, animal, hydrogenated 31
Herbicides T15b
Hydroxylamine salts 32
Intermediates, bulletin 100 24
Methyl dichloroacetate 4
Ozones 35a
Price list B15
Sebacic acid B3
Silica gel 53
Sodium acetate 38
Solvents & solvent oils, bulletin 18
Sorbitol 45b
Surface active agents, HLB selection system 45a
Vegetable oils T42b
Vinyl resins, marvinol 17
Vitamin B 12 7-8
Wetting agent-detergent, nytron I
Coatings, protective, tar base 26
Ozonators 35b
Plant sites available in Oklahoma 2
Plant sites in Nebraska 16
Refrigeration, jet T1
Sulphur 36
Trucks, dump 46

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 49
Selling Opportunities Offered 49
Positions Wanted 49

NOTICES
Auction 50

EQUIPMENT
(Used or Surplus New)
For Sale 49, 50

WANTED
Equipment 49

ADVERTISERS INDEX
Chemical Service Corp. 49
Consolidated Products Co., Inc. 49
First Machinery Corp. 49
Perry Equipment Corp. 49
Stanhope, L. M. 49
Truland Chemical & Engineering Co., Inc. 49

READER SERVICE COUPON

Mail to Chemical Industries Week, 330 W. 42nd St., N. Y. 18, N. Y.

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CITY & STATE _____

Editorial Items

11A	11D	52B	52E	52G	52I	52K
11B	38A	52C	52F	52H	52J	52L
11C	52A	52D				

Advertisements

I	2	7-8	T15b	17	26	32	36	T42b	45b	53
T1	B3	14	B15	18	29	35a	38	T42c	46	54
B1	4	T15a	16	24	31	35b	T42a	45a		

Expires August 25

BOOKLETS . . . . . .

Chemicals

***Hard Hydrocarbon**

52-p. technical bulletin giving detailed information on, "Witco M.R. #38," a blend of petroleum-derived blown asphalts, to be used in both natural and chemical rubbers as a filler, extender or softener for obtaining faster and smoother processing stocks with good physical characteristics. Indicating the results of the compound's use in various applications are photos, charts and graphs. Witco Chemical Co.

***Chemicals**

60-p. catalog, 1951 edition, covering the firm's chemicals with descriptions and uses of each and including such new additions as potassium phosphates, alkyl formates and diallyl benzene phosphonate; two-page chart summarizes industrial uses of the various chemicals. Victor Chemical Works.

Silicone-Alkyd

Data sheet giving information on the properties, suggested uses and typical solubility constants of aluminum vehicle silicone-alkyd, along with a formulation for heat resistant aluminum paint and baking schedule for this clear resin solution especially designed for low solids film applications. Plaskon Div., Libbey-Owens-Ford Glass Co.

Germicide

Revised bibliography of the literature on G-11 brand of hexachorophene, a material used as a germicide in the presence of soap and synthetic detergents; contains references and abstracts of about 50 scientific and trade articles and abstracts of 19 patents. Sindar Corp.

Equipment

Liquefied Gas Production

Booklet summarizing the firm's work in the production, handling and storage of liquefied gases and the equipment applicable to this work or to low-temperature investigations. Described and illustrated are helium liquefiers, hydrogen liquefiers, oxygen plants, helium refrigerators, low pressure gas holders, air coolers, etc. Arthur D. Little, Inc.

Packing Rings

4-p. bulletin covering five types of packing rings for use in valves, pumps, hydraulic cylinders, rams, presses and lifts. Raybestos-Manhattan, Inc.

Jacket Water Coolers

4-p. catalog noting the design features of the firm's line of engine jacket water coolers and describing the accessories available as optional equipment. Young Radiator Co.

* Request must be made to company on business letterhead.

***Laboratory Equipment**

896-p. catalog devoted to the firm's line of laboratory supplies, features over 3500 factual illustrations; new type listing individually numbers each size and style of a particular item thus eliminating the need of descriptions when ordering. New York Laboratory Supply Co.

Scientific Apparatus

60-p. publication devoted to scientific apparatus and methods, explains the principles of chemical oscillometry with reference to high frequency measurements of conductivity and dielectric constant for analysis; covers the firm's line of apparatus, giving descriptions and specifications of such items as centrifugal extractors, oscillometers and ductilometers. E. H. Sargent & Co.

Conduit System

8-p. booklet describing advantages and component parts of "Therm-o-tile" underground pipe conduit, a conduit system for the protection, support and insulation of underground pipe lines—hot or cold. H. W. Porter & Co., Inc.

Viscosity Packet

Packet containing catalog, data sheet, 1951 price lists and brochure discussing viscometers and the general subject of viscosity; described in detail are four models of viscometers, all designed for rapid and direct measurement of the viscosity or flow characteristics of materials. Brookfield Engineering Laboratories, Inc.

Water Conditioning

Bulletin devoted to the meaning, application and measurement of pH with tables reproduced to show the different pH values of common acids and alkalies as well as the most desirable pH range of industrial waters for different conditions and applications. Allis-Chalmers Mfg. Co.

Miniature Ball Bearing

Catalog listing over 250 types and sizes of miniature and instrument ball and roller bearings, along with information and line drawings of typical applications and engineering data for cleaning, load calculation, etc. Landis & Gyr, Inc.

Block Insulation

4-p. folder lists properties, applications and service recommendations for high temperature insulation; includes conductivity and heat loss graphs plus a recommended thickness table. Johns-Manville.

Conveyor and Timing Unit

Bulletin describing conveying and timing unit which when synchronized with an automatic net weigher, makes the operations of filling and conveying containers to the closing station automatic. B. F. Gump Co.

ADVERTISER'S INDEX

BUSINESS STAFF

SALES MANAGER . . . . . Bayard E. Sawyer

BUSINESS MANAGER . . . . . Albert E. Weis

Atlanta 3 . . . . . Ralph C. Maultsby, 1311 Rhodes-Haverty Bldg., Atlanta

Chicago 11 . . . . Alfred D. Becker, Jr., Frank C. Mahnke, Jr., 520 N. Michigan Ave.

Cleveland 15 . . . . Vaughan K. Dissette, 1510 Hanna Bldg.

Dallas 1 . . . . . James Cash, First National Bank Bldg.

Los Angeles 17 . . Jos. H. Allen, H. L. Keeler, 1111 Wilshire Blvd.

New York 18 . . . Knox Armstrong, Robert S. Muller, Charles L. Todaro, 330 West 42 St.

Philadelphia 3 . . . . William B. Hannum, Jr., Architects Bldg., 17th & Sansom Sts.

San Francisco 4 . . . . Ralph E. Dorland, John W. Otterson, 68 Post St.

Boston 16 . . . . . 1427 Statler Bldg.

Detroit 26 . . . . . 856 Penobscot Bldg.

Pittsburgh 22 . . . . . 738 Oliver Bldg.

St. Louis 8 . . . . 3615 Olive St., Continental Bldg.

THIS IS THE ANSWER TO YOUR "CAKING" PROBLEMS

DAVISON FINELY-SIZED SYNTHETIC SILICAS

Where caking is a problem, Davison finely-sized synthetic silicas offer double-action control. When such silicas are mixed with a granular or powdered product they not only add a thin but effective coating to the particles, but also adsorb the moisture or mother liquor that otherwise would accelerate caking. These Davison silicas are as small as .5 micron diameter with uniformity of structure insured by rigid production controls. They offer surface areas up to 1000 square meters per gram.

Being chemically and physically inert, they are adaptable in many varied applications. Davison finely-sized, amorphous synthetic silicas of high purity are currently being used as anti-caking agents in dyes, chemicals, insecticides, foods and pharmaceuticals. Davison's diversified experience and years of research are available to aid you in your caking problems. For additional information, specifications and samples of Davison silica gel write, mentioning your proposed application.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

Where Quality Counts

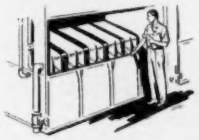
Specify

GENERAL'S

ANHYDROUS

GLAUBER'S SALT (Sodium Sulfate)

IN TEXTILE DYEING
As a Leveling Agent in the Bath



IN MANUFACTURING DYES
For Standardizing Dyes

MANUFACTURING SYNTHETIC DETERGENTS

HIGH PURITY—Due to rigid manufacturing quality controls, General's Anhydrous Glauber's Salt consistently assays 99.9% Na_2SO_4.

GOOD SOLUBILITY—Goes into solution readily and is practically free from undesirable impurities.

EFFICIENT—Produces sparkling clear solutions; helps prevent contamination of dyes or colors.

ECONOMICAL—Highly concentrated form offers economies in shipping costs.

READILY AVAILABLE—Stocked throughout General Chemical's chain of distributing stations from coast to coast.

BASIC CHEMICALS

FOR AMERICAN INDUSTRY

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo • Charlotte Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston • Jacksonville • Kalamazoo Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Providence • St. Louis San Francisco • Seattle • Yakima (Wash.)

In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver